



**MAHARAJA INSTITUTE OF TECHNOLOGY  
THANDAVAPURA**

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**VTU Question Papers**

**BE - CV**

**III to VIII Semester**

**Jun/Jul-2023**

**2018 & 2021 Scheme**

**Maharaja Institute of Technology Thandavapura**

**Just of NH-766,Mysore-ooty highway,Thandavapura( Vill & Post),Nanjangud Taluk,Mysore  
District-571302.**

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# GBCS SCHEME

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18MAT31

## Third Semester B.E. Degree Examination, June/July 2023 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Find  $L\left(\frac{\cos at - \cos bt}{t}\right)$ . (06 Marks)
- b. Express the function in terms of unit step function and hence find Laplace transform of
- $$f(t) = \begin{cases} \sin t & 0 < t < \frac{\pi}{2} \\ \cos t & \frac{\pi}{2} < t < \pi \end{cases}$$
- (07 Marks)
- c. Solve  $y''(t) + 4y'(t) + 3y(t) = e^t$ ,  $y(0) = y'(0) = 1$  by using Laplace transform method. (07 Marks)

OR

- 2 a. Find : (i)  $L^{-1}\left(\log\left(\frac{s+b}{s+a}\right)\right)$  (ii)  $L^{-1}\left(\frac{s+3}{s^2-4s+13}\right)$  (06 Marks)
- b. Find  $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$  by using convolution theorem. (07 Marks)
- c. Given  $f(t) = \begin{cases} t & 0 < t < a \\ 2a-t & a < t < 2a \end{cases}$
- where  $f(t) = f(t+2a)$  then show that  $L(f(t)) = \frac{1}{s^2} \tan h\left(\frac{as}{2}\right)$  (07 Marks)

### Module-2

- 3 a. Obtain Fourier series for  $f(x) = \frac{\pi-x}{2}$ ,  $0 < x < 2\pi$ . (06 Marks)
- b. Find Fourier series for  $f(x) = 2x - x^2$ ,  $0 < x < 2$ . (07 Marks)
- c. Find half range Fourier cosine series for
- $$f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$$
- (07 Marks)

OR

- 4 a. Find Fourier series for  $f(x) = |x|$ ,  $-\pi < x < \pi$ . (06 Marks)
- b. Obtain Fourier series for  $f(x) = \begin{cases} 0 & -2 < x < 0 \\ 1 & 0 < x < 2 \end{cases}$ . (07 Marks)
- c. Find the Fourier series upto first harmonic from the following table:

x	0	1	2	3	4	5
y = f(x)	4	8	15	7	6	2

(07 Marks)

**Module-3**

- 5 a. Find Fourier transform of  $f(x)$ , given:

$$f(x) = \begin{cases} 1, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases} \quad \text{and hence deduce that } \int_0^{\infty} \frac{\sin x}{x} dx = \frac{\pi}{2}. \quad (06 \text{ Marks})$$

- b. Find the Fourier cosine transform of

$$f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4 - x & 1 < x < 4 \\ 0 & x > 4 \end{cases} \quad (07 \text{ Marks})$$

- c. Solve  $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ , given  $u_0 = 0, u_1 = 1$  using Z - transform. (07 Marks)

**OR**

- 6 a. Find the Fourier sine transform of  $e^{-|x|}$  and hence evaluate  $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx$ . (06 Marks)

- b. Find Z-transform of  $\cos n\theta$  and  $a^n \cos n\theta$ . (07 Marks)

- c. Obtain the inverse Z-transform of  $\frac{2z^2 + 3z}{(z+2)(z-4)}$ . (07 Marks)

**Module-4**

- 7 a. Find the value of  $y$  at  $x = 0.1$  and  $x = 0.2$  given  $\frac{dy}{dx} = x^2y - 1, y(0) = 1$  by using Taylor's series method. (06 Marks)

- b. Compute  $y(0.1)$ , given  $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$  taking  $h = 0.1$ , by using Runge-Kutta 4<sup>th</sup> order method. (07 Marks)

- c. Find the value of  $y$  at  $x = 0.4$ , given  $\frac{dy}{dx} = 2e^x - y$  with initial conditions  $y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.04, y(0.3) = 2.09$  by using Milne's predictor and corrector method. (07 Marks)

**OR**

- 8 a. Using modified Euler's method, find the value of  $y$  at  $x = 0.1$ , given  $\frac{dy}{dx} = -xy^2, y(0) = 2$  taking  $h = 0.1$ . (06 Marks)

- b. Solve  $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0$  at  $x = 0.1$  taking  $h = 0.1$ , by using Runge-Kutta 4<sup>th</sup> order method. (07 Marks)

- c. Find the value  $y$  at  $x = 0.8$  given  $\frac{dy}{dx} = x - y^2$  and

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

- By using Adam's Bashforth predictor and corrector method. (07 Marks)

**Module-5**

- 9 a. Solve  $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$  for  $x = 0.2$  given  $x = 0, y = 1$  and  $\frac{dy}{dx} = 0$  by using Runge-Kutta method. (07 Marks)
- b. Derive Euler's equation in the standard form  $\frac{\partial f}{\partial y} = \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$ . (06 Marks)
- c. Find the extremal of the function  $\int_0^1 [(y')^2 + 12xy] dx$  with  $y(0) = 0$  and  $y(1) = 1$ . (07 Marks)

OR

- 10 a. Find the value of  $y$  at  $x = 0.8$ , given  $\frac{d^2y}{dx^2} = 2y \frac{dy}{dx}$  and

x	0	0.2	0.4	0.6
y	1	0.2027	0.4228	0.6841
y'	1	1.041	1.179	1.468

by using Milne's method. (07 Marks)

- b. Prove that the shortest between two points in a plane is a straight line. (06 Marks)
- c. Find the curve on which the functional  $\int_0^1 [x + y + (y')^2] dx$  with  $y(0) = 1, y(1) = 2$ . (07 Marks)

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18CV32

## Third Semester B.E. Degree Examination, June/July 2023 Strength of Materials

Time: 3 hrs.

Max. Marks: 100

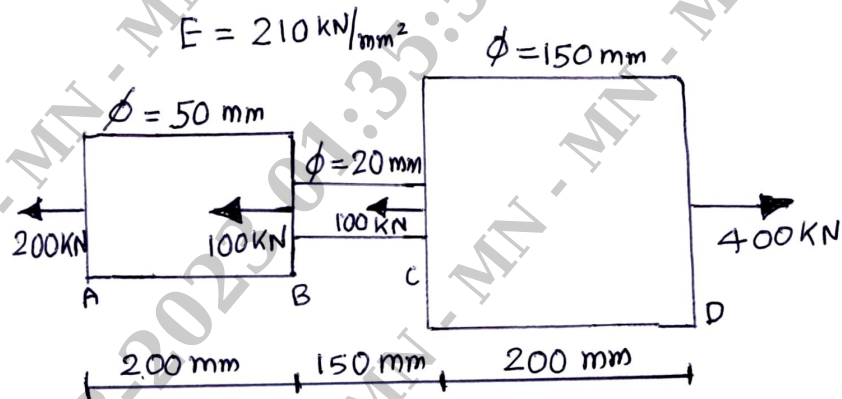
**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data may be suitably assumed.**

### Module-1

1.
  - a. Draw a typical stress-strain curve for behavior of a mild steel rod during tension test. Show salient points on the graph and briefly explain them. (06 Marks)
  - b. Derive an expression for deformation of a circular tapered bar, subjected to axial tensile force 'P'. (06 Marks)
  - c. A composite section made up of steel with 100mm internal diameter and 120mm external diameter is fitted inside a brass tube of 140mm internal diameter and 160mm external diameter, under a compressive load of 500kN. Determine stress in both materials.  $E_s = 200 \times 10^3 \text{ N/mm}^2$ ,  $E_b = 100 \times 10^3 \text{ N/mm}^2$ . Also determine deformation if length of bar is 1500mm. (08 Marks)

OR

2.
  - a. Determine the net deformation of a stepped circular bar with different forces as shown in Fig.Q.2(a). Take Young's modulus  $E = 210 \text{ kN/mm}^2$ .



- b. Establish a relation between modulus of elasticity (E), modulus of rigidity (G) and Poisson's ratio ( $\mu$ ). (06 Marks)
- c. A steel rod of 20m length is at  $20^\circ\text{C}$ . Find the expansion of the rod if the temperature rises to  $65^\circ\text{C}$ . Also find temperature stresses for following:
  - i) When expansion is fully prevented?
  - ii) An expansion of 5.8mm is allowed.
 If the temperature stress in the rod is  $35 \text{ N/mm}^2$ , what is permitted expansion in the rod? Assume  $E = 200 \text{ GPa}$  and  $\alpha = 12 \times 10^{-6}/^\circ\text{C}$ . (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-2**

- 3 a. For the 2-D stress system in the Fig.Q.3(a) find the following:
- Principal stresses
  - Maximum shear stress
  - Corresponding normal stress
  - Principal planes
  - Plane of maximum shear.

(10 Marks)

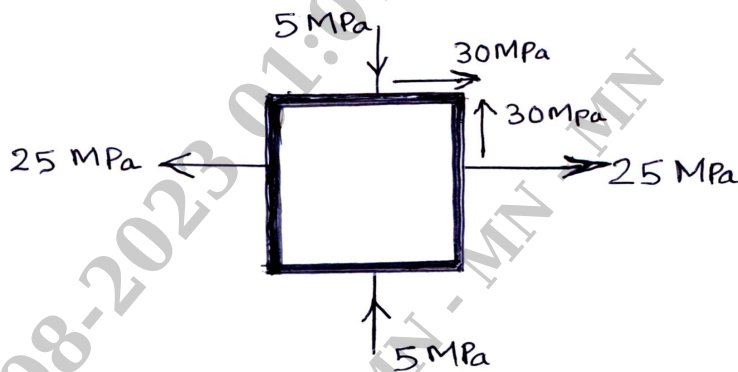


Fig.Q.3(a)

- b. Briefly explain following:
- Maximum shear stress theory
  - Maximum principal stress theory.
  - Mohr's circle.
  - Generalized 2-D stress system.
  - Principal stresses and planes.

(10 Marks)

**OR**

- 4 a. A thin cylindrical shell 5m long and 1.5m in diameter is subjected to an internal fluid pressure of 6MPa. The thickness of the shell is 15mm. Determine the circumferential and longitudinal stresses. Also determine the maximum shear stress and changes in the dimensions. Assume  $E = 200\text{GPa}$  and Poisson's ratio  $\mu = 0.3$ . (08 Marks)
- b. Differentiate between thin and thick cylinders. Also briefly explain the various stresses involved in both types of cylinders. (06 Marks)
- c. Determine the maximum and minimum hoop stresses across the section of a pipe of 400mm internal diameter and 100mm thick, when a pipe contains a fluid at a pressure  $8\text{N/mm}^2$ . Also sketch the radial pressure and hoop stress distribution across the section. (06 Marks)

**Module-3**

- 5 a. Draw SFD and BMD for the beam shown in Fig.Q.5(a). Also locate the point of contraflexure if any.

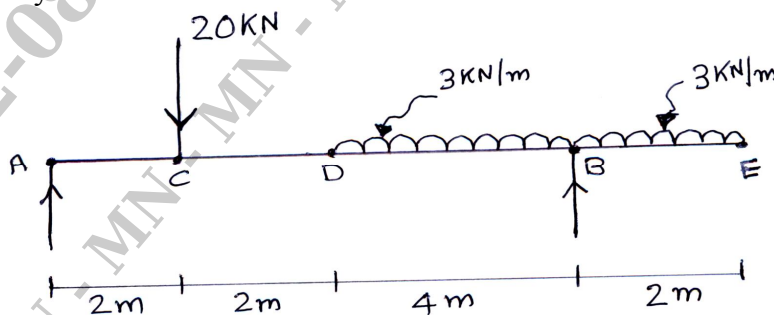


Fig.Q.5(a)

(10 Marks)



- b. Draw SFD and BMD for the beam shown in Fig.Q.5(b).

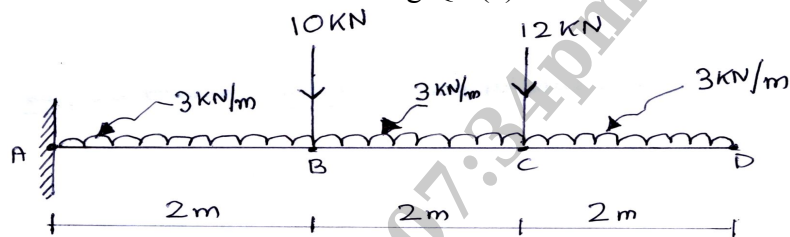


Fig.Q.5(b)

(06 Marks)

- c. Draw SFD and BMD for following standard loading cases on a simply supported beam.

- i) UDL on complete span    ii) A moment at the centre.

(04 Marks)

OR

- 6 a. Derive expression for relation between UDL intensity, shear force and bending moment.

(06 Marks)

- b. Draw SFD and BMD for the beam shown in Fig.Q.6(b). Locate point of contraflexure if any.

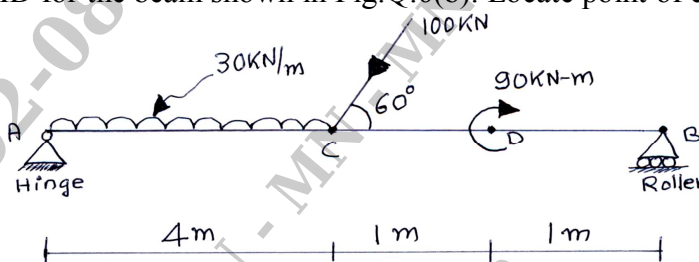


Fig.Q.6(b)

(10 Marks)

- c. Briefly explain following:

- i) Shear force  
ii) Bending moment  
iii) Types of supports

Draw sketches if necessary.

(04 Marks)

#### Module-4

- 7 a. Derive the bending equation stating the necessary assumptions.

(10 Marks)

- b. A cast iron beam is of T-section as shown in Fig.Q.7(b). The beam is simply supported on a span of 8m. The beam carries a UDL of intensity 1.5kN/m over entire span. Determine the maximum tensile and maximum compressive stresses.

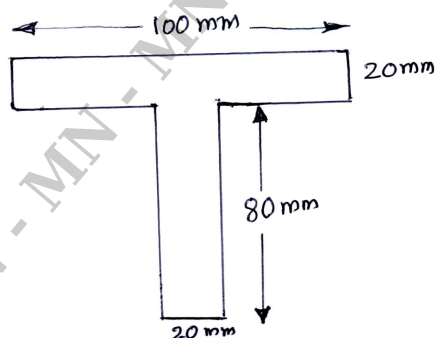


Fig.Q.7(b)

(06 Marks)

- c. Define following:
- Section modulus
  - Moment of resistance
  - Pure bending
  - Modulus of rupture.

(04 Marks)

OR

- 8 a. Derive Torsion equation stating the assumptions. (08 Marks)
- b. Determine the diameter of a solid shaft which will transmit 300kW at 250r.p.m. The maximum shear stress should not exceed  $30\text{N/mm}^2$  and twist should not be more than  $1^\circ$  in a shaft length of 2m. Assume rigidity modulus as  $1 \times 10^5\text{N/mm}^2$ . (08 Marks)
- c. Define following:
- Pure Torsion
  - Torsional rigidity
  - Polar modulus.

(04 Marks)

Module-5

- 9 a. A beam of 6m is simply supported at ends and carries two point loads 48kN and 40kN at a distance 1m and 3m respectively from left support. Determine:
- Deflection under each load.
  - Maximum deflection
  - Point of maximum deflection.
- Assume  $E = 2 \times 10^5\text{N/mm}^2$  and  $I = 85 \times 10^6\text{mm}^4$ . Adopt Macaulay's method. (10 Marks)
- b. A beam of uniform section and constant depth is freely supported over a span of 3m. It carries a point load of 30kN at the mid span. Take  $I_{xx} = 15.614 \times 10^6\text{m}^4$ . Determine:
- Central deflection
  - Slopes at the ends.
- Take  $E = 200\text{GPa}$  and use double integration method. (06 Marks)
- c. Derive an expression for relation between slope, deflection and radius of curvature. (04 Marks)

OR

- 10 a. State the assumptions made in the Euler's column theory. (04 Marks)
- b. Derive expression for crippling load when both ends of the column are hinged. (06 Marks)
- c. A hollow cylindrical cast iron column is 4m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250kN with a factor of safety of 5. Internal diameter is 0.8 times external diameter.  $\sigma_c = 550\text{N/mm}^2$ ,  $\alpha = \frac{1}{1600}$  in Rankine's formula. (10 Marks)

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18CV33

## Third Semester B.E. Degree Examination, June/July 2023 Fluid Machines

Time: 3 hrs.

Max. Marks: 100

**Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any, may be suitably assumed.

### Module-1

- 1 a. Define the following and give the SI units :
  - i) Dynamic viscosity
  - ii) Surface tension
  - iii) Mass density
  - iv) Weight density

(06 Marks)
- b. Derive expression for capillary rise and fall in a liquid. (06 Marks)
- c. A closed tank contains air, turpentine and bromine as indicated in Fig.Q1(c). Determine gauge pressure at the bottom of tank. Also express this pressure in terms of mm of mercury. Assume atmospheric pressure as 103KPa. The specific gravity of bromine is 3.1 and that of turpentine is 0.7. The air pressure in the top of the tank is measured as 25KPa vacuum. Also express bottom pressure in absolute pressure.

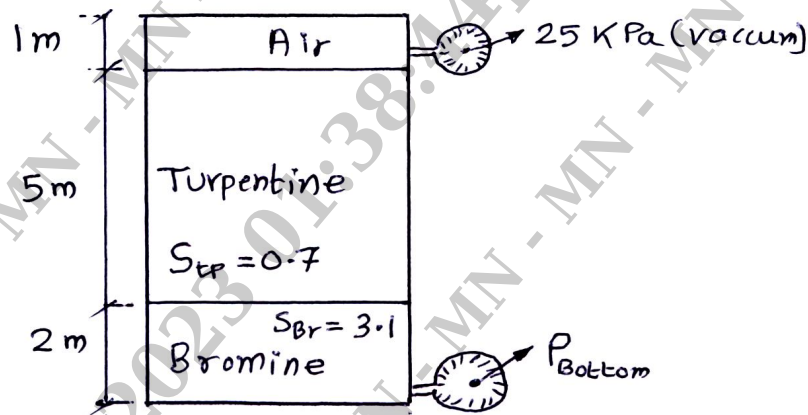


Fig.Q1(c)

(08 Marks)

**OR**

- 2 a. Derive an expression for variation of static pressure with depth inside a static mass of fluid. (06 Marks)
- b. Derive expression for finding pressure difference between two points using differential manometer. (06 Marks)
- c. A shaft of diameter 400mm rotates inside a bearing of length 100mm with 200rpm. The lubricant thickness is 1.4mm, being used in the arrangement. The dynamic viscosity of lubricant is 0.7 Pa-sec. Determine the torque and power required to overcome the viscous resistance. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-2**

- 3 a. Derive an expression for total pressure and location of center of pressure for a vertically submerged plane surface. (08 Marks)
- b. A circular plate of 2.5m diameter is immersed in water in such a way that the greatest and least depths are 3m and 1m respectively. Determine the total pressure on one face and location of center of pressure from free surface. (08 Marks)
- c. Determine the location of the centre of pressure for a dam shown in Fig.Q3(c) using pressure diagram method. Height of the water behind dam is 5m and width of the dam is 20m. Also find the value of total pressure.



Fig.Q3(c)

(04 Marks)

**OR**

- 4 a. Derive continuity equation for one dimensional flow. (04 Marks)
- b. Prove that equipotential lines are orthogonal to stream lines at all points of intersection. (08 Marks)
- c. In a 2 – D flow the velocity potential  $\phi$  is given by  $\phi = x[2y - 1]$ . Determine the velocity at point P(4, 5). Also determine the value of stream function  $\psi$  at the point 'P'. (08 Marks)

**Module-3**

- 5 a. Derive Euler's equation of motion and then obtain Bernoulli's equation. State the assumptions and limitation of Bernoulli's theorem. (10 Marks)
- b. A converging pipe of 0.3m diameter at inlet and 0.15m diameter at outlet carries a water flow. Inlet is 6m above datum and outlet is 1m above the datum. Inlet pressure is  $1.5 \times 10^5 \text{ N/m}^2$  and inlet velocity is 5m/s. Determine the outlet velocity and pressure. Neglect the losses. (05 Marks)
- c. 250 LPS of water is flowing in a pipe having diameter 0.3m. The pipe is bent by  $135^\circ$  with respect to initial flow direction. Determine the magnitude and direction of the resultant force on the bend. Take water pressure as 392.4KPa. (05 Marks)

**OR**

- 6 a. A  $0.3\text{m} \times 0.15\text{m}$  venturimeter is fixed in a vertical pipeline carrying oil of specific gravity 0.9, the flow being upwards. The difference between elevation of throat and inlet of venturimeter is 0.3m. The U – tube differential manometer shows a gauge deflection of 0.25m. Determine the oil flow rate in the pipe line and pressure difference between inlet and throat.  $C_d = 0.98$  and specific gravity of mercury is 13.6. Draw the necessary diagram. (10 Marks)
- b. Briefly explain the working principle of orificemeter with a sketch. (05 Marks)
- c. A sub-marine moves horizontally in sea and has its axis 15m below the surface of water. A pitot tube is placed in front of the submarine and along its axis is connected to the two limbs of U-tube containing mercury. The difference of mercury level is 170mm. Find the speed of the sub-marine, assuming specific gravity of mercury as 13.6 and that of sea water as 1.026 with respect to fresh water. (05 Marks)

**Module-4**

- 7 a. Derive an expression for discharge through a triangular notch. (06 Marks)  
 b. Give various classifications of orifice and mouthpiece. (06 Marks)  
 c. A jet of water coming from an orifice of 25mm diameter under a head of 1.5m falls vertically 0.915m before it strikes the ground at a distance of 2.288m measured horizontally from vena – contracta. The flow rate is 102 LPM. Determine the hydraulic coefficients. (08 Marks)

**OR**

- 8 a. Derive expression for hydraulic coefficients of an orifice using Jet distance measurement method. (06 Marks)  
 b. Briefly explain :  
 i) Cipolletti notch  
 ii) Ventilation of notch. (06 Marks)  
 c. A rectangular weir of crest length 0.5m is used to measure flow rate in a rectangular channel of 0.8m wide and 0.7m deep. Water level is 80mm above weir crest. Determine the flow rate in the channel. Use velocity of approach method.  $C_d = 0.62$ . Consider one trial. (08 Marks)

**Module-5**

- 9 a. Derive Darcy – Weisbach equation for friction loss in a pipe. (08 Marks)  
 b. Briefly explain :  
 i) Major loss  
 ii) Minor loss  
 iii) Hydraulic gradient line (04 Marks)  
 c. The water is flowing in a pipe with velocity 1.5m/s, having length 2500m and diameter 500mm. Find the rise in pressure in the pipe of valve closed in : i) 25 seconds ii) 3 second. Assume  $C = 1460$  m/s. (08 Marks)

**OR**

- 10 a. Briefly explain the term water hammer in pipes. (06 Marks)  
 b. Derive an expression for pressure rise in a pipe when valve is gradually closed. (06 Marks)  
 c. Three pipes of 400mm, 200mm and 300mm diameter have lengths of 400m, 200m and 300m respectively. These pipes are connected in series to form a compound pipe. The ends of pipes are connected to two tanks with a difference in water levels of 16m. The friction coefficient is 0.005 for all pipes. Determine the discharge in the compound pipe by neglecting minor losses. (08 Marks)

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## Third Semester B.E. Degree Examination, June/July 2023 Basic Surveying

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Discuss in detail with sketches the principles of surveying. (10 Marks)  
 b. Write a note on Survey of India Map numbering system with examples. (10 Marks)

**OR**

- 2 a. With figure discuss how do you carry out direct and indirect ranging of lines. (10 Marks)  
 b. Write note on :  
 i) Electronic Distance Measurement  
 ii) Booking of Field Notes  
 iii) Obstacles in chaining and ranging (10 Marks)

### Module-2

- 3 a. What is local attraction in compass survey? Give its relevance. (08 Marks)  
 b. The following bearings were taken in a closed compass traverse.

Line	Fore Bearing	Back Bearing
AB	48° 25'	230° 00'
BC	177° 45'	356° 00'
CD	104° 15'	284° 55'
DE	165° 15'	345° 15'
EA	259° 30'	79° 00'

State the stations affected by local attraction and by how much and determine the correct bearings. (12 Marks)

**OR**

- 4 a. Give the relevance of magnetic dip and declination in compass survey. (08 Marks)  
 b. The magnetic bearing of a line is N 60° 30' W in 1994 when the declination was 5° 10' E. Find the present magnetic bearing if declination is 3° W. (06 Marks)  
 c. Distinguish between True bearing and Magnetic bearing. (06 Marks)

### Module-3

- 5 a. Describe with sketches the collimation method of reducing levels and compare the collimation method with the rise and fall method. (10 Marks)  
 b. The following consecutive readings were taken with a level and 4.0m staff on a continuously sloping ground at a common interval of 30m:  
 0.780, 1.535, 1.955, 2.430, 2.985, 3.480, 1.155, 1.960, 2.365, 3.640, 0.935, 1.045, 1.630 and 2.545.

The reduced level of the first point A = 180.750m. Calculate the reduced levels of the points by the collimation method and get the gradient of the joining first and last point? (10 Marks)

OR

- 6 a. Discuss on the curvature and refraction effect in levelling? (10 Marks)  
 b. The following notes refers to the reciprocal levels taken with one level.

Instrumentation station	Staff readings on		Remarks
	A	B	
A	1.030	1.630	Distance AB = 800m
B	0.950	1.540	RL of A = 450m

Find the true difference of elevation between A and B. Also find the collimation error of instrument. (10 Marks)

**Module-4**

- 7 a. State the advantages and disadvantages of plane tabling. (10 Marks)  
 b. Discuss with sketches the intersection and resection method of plotting of points in plane tabling. (10 Marks)

OR

- 8 a. State the 3-point problem and explain how it is solved by the graphical method. (10 Marks)  
 b. Discuss on the errors in plane table survey. (10 Marks)

**Module-5**

- 9 a. State and prove the trapezoidal and Simpson's rule for determining the area. (10 Marks)  
 b. Calculate the area of the zero circle with the following data. The multiplying constant is  $100 \text{ cm}^2$ .

Initial Readings	Final Reading	Position of anchor point	Remarks
6.520	2.724	Outside the figure	Zero of the disk crossed fixed index mark once in clockwise direction
1.222	7.720	Inside the figure	Aero of the disc crossed the fixed index marks twice in the anticlockwise direction

(10 Marks)

OR

- 10 a. Discuss in detail indirect method of contouring and direct method of contouring. (10 Marks)  
 b. From a topographical map, the areas enclosed by contour lines for a proposed dam are given below. Find the volume of the impounded water using trapezoidal formula and prismoidal formula.

Contours (m)	Area enclosed (Hectares)
500	20
505	100
510	400
515	900
520	1100

(10 Marks)

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## Fourth Semester B.E. Degree Examination, June/July 2023

### Complex Analysis, Probability and Statistical Methods

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

#### Module-1

- 1 a. Find analytic function  $u + iv$ , where  $u$  is given to be  $u = e^x[(x^2 - y^2) \cos y - 2xy \sin y]$ . (06 Marks)
- b. Derive Cauchy Reimann equations in polar form. (07 Marks)
- c. Show that  $u = e^{2x} [x \cos 2y - y \sin 2y]$  is harmonic. Find the analytic function  $f(z) = u + iv$ . (07 Marks)

#### OR

- 2 a. Derive Cauchy Reimann equation in Cartesian form. (06 Marks)
- b. Determine analytic function  $f(z) = u + iv$  if  $u - v = e^x [\cos y - \sin y]$ . (07 Marks)
- c. Show that  $w = z^n$  is analytic and hence find its derivative. (07 Marks)

#### Module-2

- 3 a. Discuss the transformation  $w = z + \frac{1}{z}, z \neq 0$ . (06 Marks)
- b. Find the Bilinear transformation which maps the points  $z = 1, i, -1$  onto  $w = 0, 1, \infty$ . (07 Marks)
- c. Evaluate  $\int_0^{2+i} (\bar{z})^2 dz$  along i) line  $y = x/2$  ii) real axis to 2 and then vertically to  $2 + iy$ . (07 Marks)

#### OR

- 4 a. Discuss the transformation  $w = z^2$ . (06 Marks)
  - b. State and prove Cauchy's integral formula  $f(a) = \frac{1}{2\pi i} \int_C \frac{f(z)}{z-a} dz$ . (07 Marks)
  - c. Evaluate using Cauchy's integral formula. (07 Marks)
- $$\int_C \frac{e^{2z}}{(z-1)(z-2)} dz \quad C: |z| = 3.$$

#### Module-3

- 5 a. Define: i) Random variable ii) Discrete probability distribution with an example. (06 Marks)
- b. The probability that man aged 60 will live upto 70 is 0.65. What is the probability that out of 10 men, now aged 60 i) Exactly 9 ii) atmost 9 iii) Atleast 7 will live up to age of 70 years. (07 Marks)
- c. In a normal distribution, 3% of items are under 45 and 8% are over 64. Find the mean and standard deviation, given that  $A(0.5) = 0.19$  and  $A(1.4) = 0.42$ . (07 Marks)



OR

- 6 a. The probability distribution of a finite random variable X is given by

X :	-2	-1	0	1	2	3
P(x) :	0.1	K	0.2	2K	0.3	K

Find 'K', mean and variance of X.

(06 Marks)

- b. If probability of bad reaction from certain injection is 0.001. Determine the chance that out of 2000 individuals more than two will get bad reaction, and less than two will get bad reaction.

(07 Marks)

- c. The frequency of accidents per shift in a factory is shown in the following table:

Accidents per shift	0	1	2	3	4
Frequency	192	100	24	3	1

Calculate mean numbers of accidents per shift. Find the corresponding Poisson distribution.

(07 Marks)

**Module-4**

- 7 a. Fit a second degree parabola  $y = a + bx + cx^2$  for the following data:

x	0	1	2	3	4	5
y	1	3	7	3	21	31

(06 Marks)

- b. Find the coefficient of correlation, lines of regression of x on y and y on x. Given,

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(07 Marks)

- c. If  $\theta$  is an acute angle between line of regression, then show that  $\tan \theta = \frac{\sigma_x}{\sigma_y} \left( \frac{1-r^2}{r} \right)$ .

Indicate the significance of the cases  $r = 0$  and  $r = \pm 1$ .

(07 Marks)

OR

- 8 a. Fit the curve of the form  $ax^b$  and hence estimate y when  $x = 8$ .

x	5	10	15	20	25	30	35
y	2.76	3.17	3.44	3.64	3.81	3.95	4.07

(06 Marks)

- b. Find the rank correlation coefficient for the following data:

x	93	44	53	08	71	81	6	10	32	31
y	45	62	12	28	92	84	73	3	51	32

(07 Marks)

- c. With the usual notations compute  $\bar{x}$ ,  $\bar{y}$  and r from the following lines of regression:

$$y = 0.516x + 33.73 \quad \text{and} \quad x = 0.512y + 32.52.$$

(07 Marks)

**Module-5**

- 9 a. The joint probability distribution for following data

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.1	0

Determine the marginal distributions of X and Y also calculate  $E(x)$ ,  $E(y)$ ,  $COV(xy)$ .

(06 Marks)

- b. Define: i) Null hypothesis ii) Confidence limits iii) Type I, Type II errors.

(07 Marks)

- c. The following table gives the distribution of digits in the numbers chosen at random from a telephone directory:

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	1026	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory.

(given  $\chi_{0.05}^2 = 16.92$  at  $n = 9$ ).

(07 Marks)

OR

- 10 a. A fair coin is tossed thrice. The random variable X and Y are defined as follows. X = 0 or 1 according as head or tail occurs on first loss, Y = number of heads.
- Determine distribution of X and Y.
  - Joint probability distribution of X and Y.
  - Expectation of X, Y and XY. (06 Marks)
- b. It is claimed that a random sample of 49 tyres has a mean life of 15200km. Is the sample drawn from population whose mean is 15,150km and standard deviation is 200km? Test the significance level at 0.05 level. (07 Marks)
- c. Ten individuals are chosen at random from the population and their height in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that the mean height of universe is 66' (value of  $t_{0.05} = 2.262$  for 9.D.F). (07 Marks)

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# CBCS SCHEME

USN

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18CV42

## Fourth Semester B.E. Degree Examination, June/July 2023 Analysis of Determinate Structures

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Determine the static degree of indeterminacy for the following structures shown in Fig.Q1(a). Neglect axial deformation.

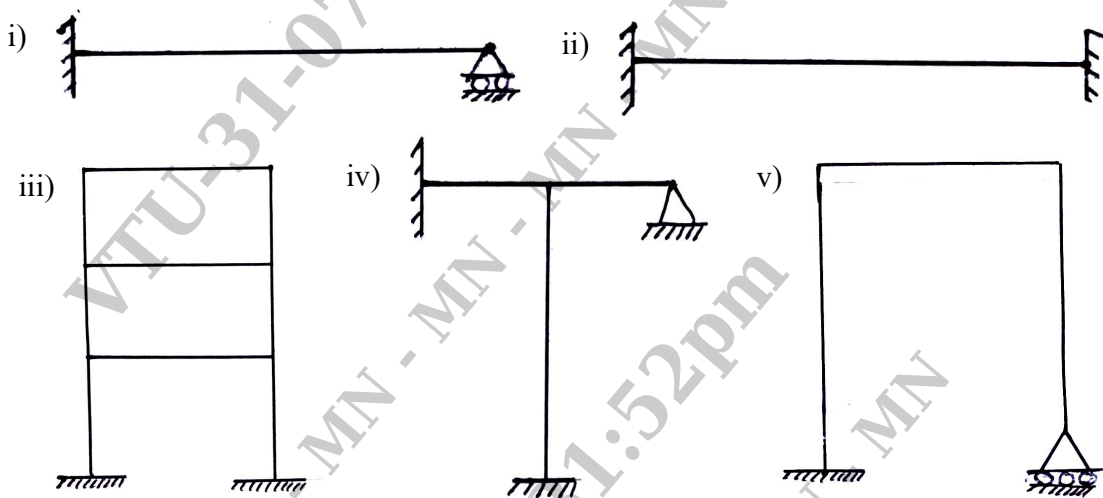


Fig.Q1(a)

(10 Marks)

- b. A simply supported beam of 15 meter span is subjected to uniform dead load of 50kN/m covering the entire span and a uniform live load 100kN/m (longer than the span). Determine the value of positive as well as negative shear force at left quarter span. (10 Marks)

OR

- 2 a. A simply supported beam has a span of 15m. Uniformly distributed load of 40kN/m and 5m long crosses the girder from left to right. Draw the influence line diagram for shear force and bending moment at a section 6m from left end. Use these diagrams to calculate the maximum shear force and bending moment at this section. (10 Marks)
- b. Using influence line diagrams determine the shear force and bending moment at section 'C' in the simply supported beam as shown in Fig.Q2(b).

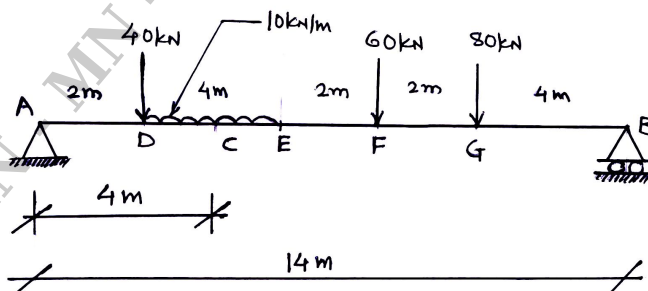


Fig.Q2(b)

1 of 4

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-2**

- 3 a. A uniformly distributed load of intensity  $2\text{kN/m}$  and  $5\text{m}$  long crosses a simply supported beam of  $20\text{m}$  span from left to right. Calculate :
- Maximum shear force and maximum bending moment at a section  $8\text{m}$  from the left support
  - Absolute maximum bending moment. **(10 Marks)**
- b. Two wheel loads of  $160\text{kN}$  (leading loads) and  $400\text{kN}$  spaced  $2\text{m}$  apart move on a simply supported beam girder of span  $16\text{m}$  from left to right. Find the maximum positive and negative shear force at a section.
- $4\text{m}$  from the left end
  - $6\text{m}$  from the left end. **(10 Marks)**

**OR**

- 4 a. The system of concentrated loads shown in Fig.Q4(a) rolls from left to right on the girder of span  $15\text{m}$ ,  $40\text{kN}$  load leading. For a section  $4\text{m}$  from left support, determine :
- Maximum bending moment
  - Maximum shear force.

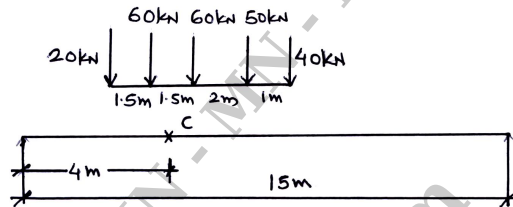


Fig.Q4(a)

**(10 Marks)**

- b. Draw influence line diagram for members  $L_1L_2$ ,  $U_1L_2$  and  $U_1U_2$  of the truss as shown in Fig.Q4(b).

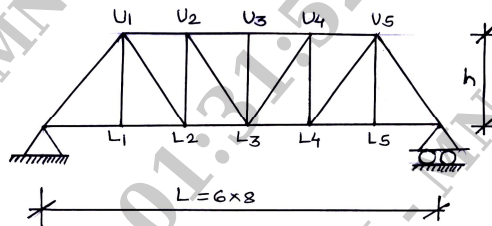


Fig.Q4(b)

**(10 Marks)****Module-3**

- 5 a. Write the conjugate beam theorems. **(02 Marks)**
- b. Determine  $\theta_A$ ,  $\theta_B$ ,  $\theta_C$  and deflection at 'C' in the beam shown in Fig.Q5(b) by conjugate beam method.

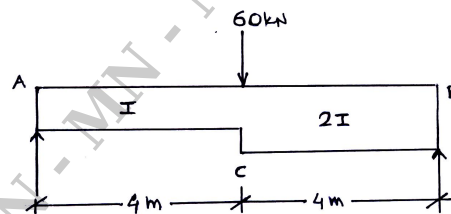


Fig.Q5(b)

**(08 Marks)**

- c. Determine the slope and deflections at B and C in the cantilever beam shown in Fig.Q5(c) by conjugate beam method.

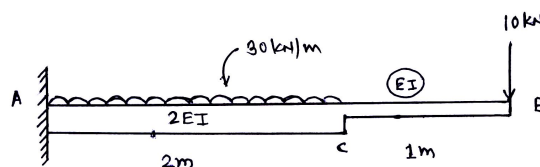
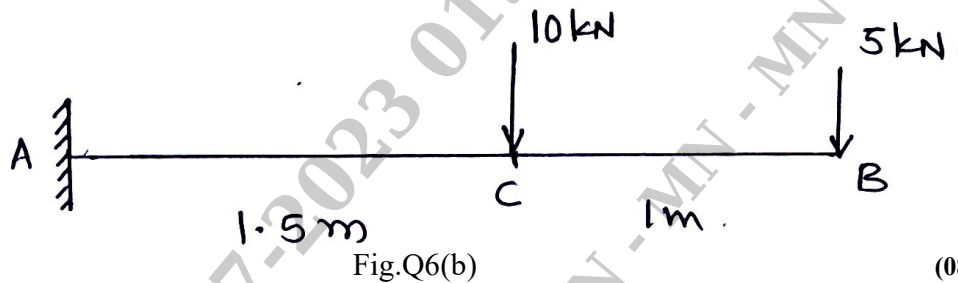


Fig.Q5(c)

**(10 Marks)**

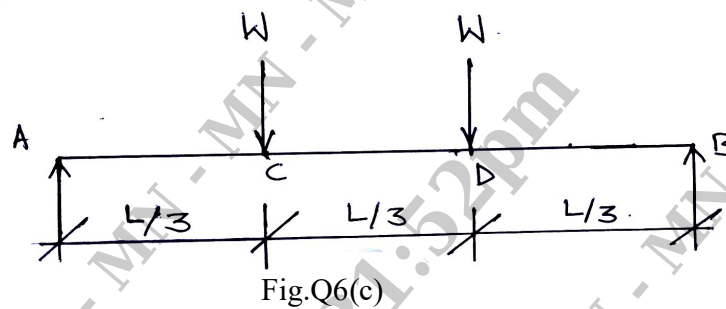
OR

- 6 a. Write the moment area theorem. (02 Marks)  
 b. Determine the slope and deflection at the free end of a cantilever beam as shown in Fig.Q6(b) by moment area method. (Take  $EI = 4000\text{kN m}^2$ ).



(08 Marks)

- c. Determine the rotation at supports and deflection at mid-span and under the loads in the simply supported beam as shown in Fig.Q6(c).



(10 Marks)

#### Module-4

- 7 Determine the vertical and horizontal displacement at the free end 'D' in the Fig.Q7(a). Take  $EI = 12 \times 10^{13}\text{N-mm}^2$ . Use Castigliano's theorem.

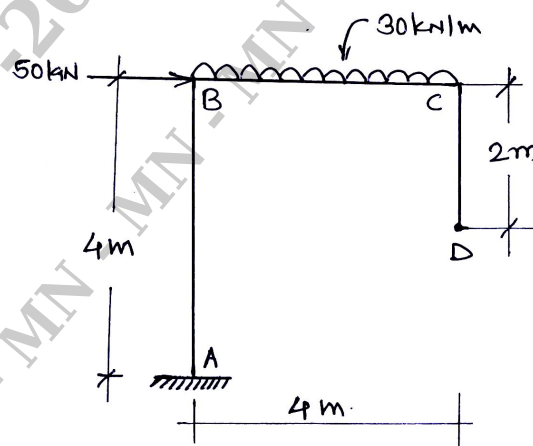


Fig.Q7(a)

(20 Marks)

OR

- 8 a. Find the vertical deflection of the joint B in the truss loaded as shown in Fig.Q8(a). The cross-sectional area of the members in mm are shown in brackets. Take  $E = 200\text{kN/mm}^2$ .

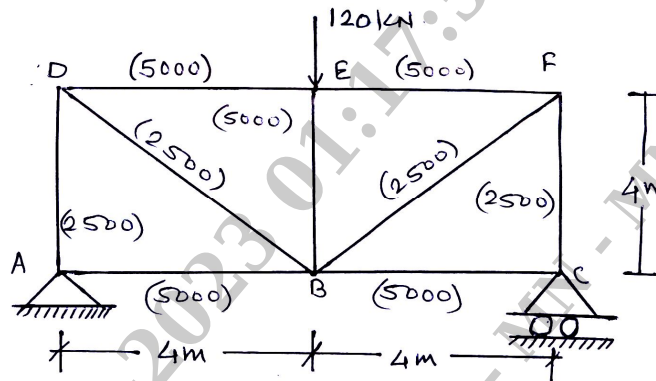


Fig.Q8(a)

(10 Marks)

- b. Determine the vertical deflection of point 'D' in the truss shown in Fig.Q8(b). The cross-sectional areas of members AD and DE are  $1500\text{mm}^2$  while those of the other members are  $1000\text{mm}^2$ . Take  $E = 200\text{kN/mm}^2$ .

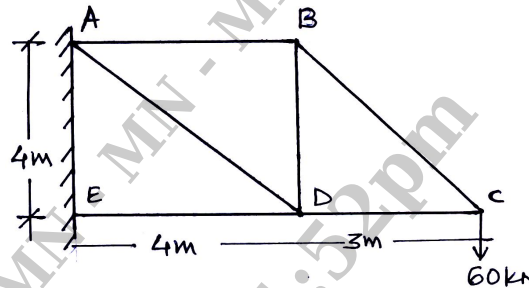


Fig.Q8(b)

(10 Marks)

**Module-5**

- 9 a. A three hinged circular arch hinged at the springing and crown points has a span of 40m and a central rise of 8m. It carries a uniformly distributed load  $20\text{kN/m}$  over the left-half of the span together with a concentrated load of  $100\text{kN}$  at the right quarter span point. Find the reactions at the supports, normal thrust and shear at a section 10m from left support. (10 Marks)
- b. A light cable 18m long is supported at two ends at the same level. The supports are 16m apart. The cable supports 120N load dividing the distance into two equal parts. Find the shape of the cable and tension in cable. (10 Marks)

OR

- 10 a. A circular arch of span 25m with a central rise 5m is hinged at the crown and springing. It carries a point load of  $100\text{kN}$  at 6m from the left support. Calculate :  
 i) The reactions at the supports  
 ii) The reactions at crown  
 iii) Moment at 5m from the left support. (10 Marks)
- b. A light flexible cable 18m long is supported at two ends at the same level. The supports are 16m apart. The cable is subjected to uniformly distributed load of  $1\text{kN/m}$  of horizontal length over its entire span. Determine the reactions developed at the support. (10 Marks)

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## Fourth Semester B.E. Degree Examination, June/July 2023 Applied Hydraulics

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define the terms : (i) Reynold's number (ii) Froude's number (iii) Euler's number  
(iv) Webber's number (v) Mach number (05 Marks)
- b. Using Buckingham's  $\pi$ -theorem, show that the velocity through a circular orifice is given by
- $$V = \sqrt{2gH} \phi \left[ \frac{\Delta}{H}, \frac{\mu}{\rho V H} \right],$$
- where H is the head causing flow,  $\Delta$  is the diameter of the orifice,  $\mu$  is co-efficient of viscosity,  $\rho$  is the mass density and g is the acceleration due to gravity. (15 Marks)

**OR**

- 2 a. State and prove the Buckingham's  $\pi$ -theorem. Why this theorem is considered superior over the Rayleigh's method. (10 Marks)
- b. A pipe of diameter 1.5 m is required to transport an oil of Sp.Gr. 0.90 and viscosity  $3 \times 10^{-2}$  poise at the rate of 3000 litre/s. Tests were conducted on a 15 cm diameter pipe using water at  $20^\circ\text{C}$ . Find the velocity and rate of flow in the model. Viscosity of water at  $20^\circ\text{C} = 0.01$  poise. (10 Marks)

### Module-2

- 3 a. What is meant by economical section of a channel? Derive the condition for the most economical rectangular section. (10 Marks)
- b. The discharge of water through a rectangular channel of width 8 m is  $15 \text{ m}^3/\text{s}$ . when depth of flow of water is 1.2 m. Calculate (i) Specific energy of the flowing water (ii) Critical depth and critical velocity (iii) Value of minimum specific energy. (10 Marks)

**OR**

- 4 a. Derive an expression for discharge through open channel by Chezy's formula and obtain an expression for conveyance. (10 Marks)
- b. A trapezoidal channel has side slopes of 3H to 4V and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is to carry water at  $0.5 \text{ m}^3/\text{s}$ .  $[C = 80]$ . (10 Marks)

### Module-3

- 5 a. The depth of flow of water, at a certain section of a rectangular channel of 2 m wide, is 0.3 m. The discharge through the channel is  $1.5 \text{ m}^3/\text{s}$ . Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy. (10 Marks)
- b. Define the terms : (i) Afflux (ii) Back water curve. Prove that the length of the back water curve is given by,  $L = \frac{(E_2 - E_1)}{i_b - i_e}$ . (10 Marks)

OR

- 6 a. Explain the term hydraulic jump. Derive an expression for the depth of hydraulic jump in terms of the upstream Froude number. (10 Marks)
- b. Find the slope of the free water surface in a rectangular channel of width 20 m, having depth of flow 5 m. The discharge through the channel is  $50 \text{ m}^3/\text{s}$ . The bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant  $C = 60$ . (10 Marks)

**Module-4**

- 7 a. Obtain an expression for the work done per sec by water on the runner of a pelton wheel. Hence derive an expression for max. efficiency of pelton wheel. (10 Marks)
- b. A jet of water of dia. 10 cm strikes a flat plate normally with a velocity of 15 m/s. The plate is moving with a velocity of 6 m/s in the direction of the jet and away from the jet. Find
- The force exerted by the jet on the plate.
  - Work done by the jet on the plate per second. (10 Marks)

OR

- 8 a. Draw a neat sketch of hydro electric power plant and mention the function of each component. (10 Marks)
- b. A Pelton wheel is to be designed for the following specifications:  
Shaft power = 11772 kW, Head = 380 m, Speed = 750 rpm, Overall efficiency = 86%, Jet diameter is not to exceed one-sixth of the wheel diameter.  
Determine (i) Wheel dia. (ii) No. of jets (iii) Dia. of jet. (10 Marks)

**Module-5**

- 9 a. Draw a neat sketch of Kaplan Turbine and explain the function of each part in brief. (10 Marks)
- b. Derive an expression for the minimum starting speed of a centrifugal pump. (10 Marks)

OR

- 10 a. With a neat sketch, explain the components and working of a centrifugal pump. (10 Marks)
- b. A Kaplan turbine develops 24647.6 kW power at an average head of 39 m. Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the base equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine. (10 Marks)

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# CBCS SCHEME

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18CV45

## Fourth Semester B.E. Degree Examination, June/July 2023 Advanced Surveying

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Explain the Repetition method of measuring horizontal angles by a transit theodolite. List the errors eliminated by this method. (10 Marks)
- b. To measure the elevation of a tower, observations were made from two instrument stations P & Q. Determine the elevation to the top of the tower.

Top of tower	Station Points	Horizontal Angle	Vertical Angle	Staff reading	Remarks
R	P	62° 18'	20° 12'	2.240 mts	• R.L of BM = 500 mts • Distance b/w P & Q = 80 mts
	Q	72° 42'	21° 06'	3.300 mts	

(10 Marks)

### OR

- 2 a. Define the following with reference to a theodolite : (04 Marks)  
 i) Horizontal Axis ii) Line of Collimation iii) Left Face Observation iv) Swinging.
- b. Explain the horizontal axis adjustment of a transit theodolite by the spine test. (06 Marks)
- c. The top of a signal spine P was sighted from two points A & B, being at very different levels and in line with 'P' the angle of elevation from A & B to P were 40° 20' and 20° 30' respectively. The angle of elevation from B to a target 2.5m above the foot of the staff held at A is 16° 15'. The height of instrument A and B are 1.750 mts and 1.545 mts. The horizontal distance between A and B was 100 mts. The R.L of B was 150.500 mts. Determine the RL of P and horizontal distance of the signal spire from B. (10 Marks)

### Module-2

- 3 a. Derive the distance and elevation formula for a staff held vertical and line of sight being inclined in tachometry. (06 Marks)
- b. Explain Satellite stations and Reduction to centre. (04 Marks)
- c. To determine the gradient between two points A & B, the following observations were made with a tacheometer fitted with an analytical lens and having multiplying constant 100, with the staff kept vertical. (10 Marks)

Instrument e	Staff e	Bearing	Vertical angle	Stadia Reading
P	A	134°	+10° 32'	1.360, 1.915, 2.470
	B	224°	+ 5° 6'	1.065, 1.885, 2.705

### OR

- 4 a. Explain First order, Second order and Third order triangulation system. (06 Marks)
- b. What are important factors to be considered in selection of site for a base line? (06 Marks)
- c. From an eccentric station S, 12.25 mts to nest of main station B, the following angles were measured  $\angle BSC = 76^\circ 25' 32''$  ;  $\angle CSA = 54^\circ 32' 20''$ . The stations S and C are to opposite sides of line AB. Calculate the correct angle ABC if the length of AB and BC are 5286.50 and 4932.20 mts respectively. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. Define the following with a neat sketch : i) Point of curvature    ii) Length of long chord  
 iii) Deflection angle    iv) Vertex distance. **(04 Marks)**
- b. Explain various types of vertical curves with sketches. **(04 Marks)**
- c. The following data refer to a compound curve which bears to right :  
 • Total deflection angle =  $93^\circ$     • Degree of 1<sup>st</sup> curve =  $4^\circ$     • Degree of 2<sup>nd</sup> curve =  $5^\circ$   
 • Point of intersection is at 45 + 21 (20m units).  
 Determine in 20mts units the running distance of the tangent points and point of compound curvature, given the latter is 6 + 24 from point of intersection @ back angle of  $290^\circ 36'$  from the 1<sup>st</sup> tangent. **(12 Marks)**

**OR**

- 6 a. What is Transition curve? List the functions and essential requirements of an ideal transition curve. **(04 Marks)**
- b. A road bond deflects  $80^\circ$  and is to be designed for a maximum speed of 100 kmph and centrifugal ratio  $\frac{1}{4}$ . The maximum rate of change of acceleration =  $30\text{cm/sec}^3$ . The curve consists of a circular arc combined with two spirals. Calculate the radius of circular curve, length of transition curve, total length of combined curve, chainages at beginning and end of transition curve and junctions of transition curve with circular curve? The chainage at point of intersection is 42862 mts. **(08 Marks)**
- c. Explain the method of setting out simple curve by deflection distances method. **(08 Marks)**

**Module-4**

- 7 a. Define the following : i) Vertical photograph    ii) Nadir point    iii) Drift  
 iv) Exposure station    v) Flight line    vi) Focal length. **(06 Marks)**
- b. Explain Scale of a vertical photograph. **(04 Marks)**
- c. Two points A & B having elevations 500mts and 300mts respectively above datum appear on a vertical photograph having focal length 20cm and flying altitude of 2500 mts their corrected photographic coordinates are

Point	X(cm)	Y(cm)
a	+ 2.64	+ 1.36
B	- 1.92	+ 3.65

Determine the length of the ground AB. **(10 Marks)**

**OR**

- 8 a. What is Relief displacement? Derive its expression. **(08 Marks)**
- b. List the reasons for overlap. **(04 Marks)**
- c. The scale of a aerial photograph is 1cm = 100m. The photography size is 30cm × 20cm. Determine the number of photographs required to cover an area 10km × 10km, if the longitudinal overlap is 60% and side lap is 30%. **(08 Marks)**

**Module-5**

- 9 a. Mention advantages of total station and describe its working principle. **(10 Marks)**
- b. Define Remote Sensing. Explain the idealized remote sensing system. **(10 Marks)**

**OR**

- 10 a. Explain GIS and mention its applications in Civil Engineering. **(10 Marks)**
- b. Define GPS. Explain the working principle of GPS. **(10 Marks)**

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# CBCS SCHEME

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18CV46

## Fourth Semester B.E. Degree Examination, June/July 2023 Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Draw neat diagrams wherever required.*

### Module-1

- 1 a. Define “per capita demand”. How is it estimated? Discuss the factors that influence the per capita demand. (08 Marks)
- b. Discuss the decreasing rate of growth method and the logistic curve method of population forecasting (06 Marks)
- c. A water supply scheme has to be designed for a city having a population of 2.5 lakhs. Estimate the important kinds of drafts which may be required to be recorded for an average water consumption of 180 lpcd. Also record the required capacities of major components of the proposed water works system for the city using a river as a source of supply. Assume suitable data, wherever needed. Take maximum daily draft as 1.8 times the average. (06 Marks)

OR

- 2 a. Explain the terms:  
i) Fire demand    ii) Coincident draft    iii) Whole some water    iv) Design period (08 Marks)
- b. Enumerate the significance of public water supply scheme in the present-day civil life. (06 Marks)
- c. The population of a locality as obtained from census report is as follows:

Census year	1971	1981	1991	2001	2011
Population	3,50,000	4,66,000	9,94,000	15,60,000	16,23,000

Estimate the population in the locality in the year 2021 and 2041 by incremental inverse method. (06 Marks)

### Module-2

- 3 a. Discuss the objectives of water treatment. With a flow chart, explain the significance of each unit in the process of water treatment. (08 Marks)
- b. With a neat sketch, explain the working of an infiltration gallery. (06 Marks)
- c. Enumerate the significance of the following from water quality criteria:  
(i) Chlorides    (ii) Hardness    (iii) E-coli (06 Marks)

OR

- 4 a. Compare the surface and sub-surface sources of water with respect to available forms, quality and quantity. (08 Marks)
- b. With a neat sketch, explain the working of a wet intake tower. (06 Marks)
- c. Write short notes on :  
(i) Specific conductivity of water    (ii) Turbidity of water (06 Marks)

**Module-3**

- 5 a. With a neat sketch, explain the various components of a coagulation-sedimentation tank. (08 Marks)
- b. Compute the settling velocity of a discrete particle in water under the condition when Reynolds number is less than 0.5. The diameter and specific gravity of the particle is 0.05mm and 2.65 respectively. Temperature of water is 20°C and kinematic viscosity of water is  $1.01 \times 10^{-2} \text{ m}^2/\text{sec}$ . (04 Marks)
- c. Design a rapid sand filter unit for treating and MLD of water. Assume 4% of filtered water is used for washing water everyday for a period of 30 minutes. Take length of filter bed as 1.5 times the width and rate of filtration as 5,000 litres/hour/sq.m. (08 Marks)

**OR**

- 6 a. Explain the mechanism of filtration. (06 Marks)
- b. Design six slow sand filter beds from the following data:  
Population to be served : 50,000 persons ; Per capita demand : 150 litres/head/day  
Rate of filtration : 180 litres/head/sq.m ; Length of each bed : Twice the breadth.  
Assume maximum demand as 1.8 times the average daily demand, and one unit, out of six, will be kept as standby. (06 Marks)
- c. A rectangular sedimentation tank is to handle 12 MLD of raw water with length equal to twice its width. The particles are larger than 0.04 mm in size. Assuming the specific gravity of the particles as 2.65 and the temperature as 20°C, determine the tank dimensions. If the depth of the tank is 4m, compute the detention time. (08 Marks)

**Module-4**

- 7 a. Compare lime-soda process with zeolite process of softening water under the following criteria:  
(i) Sludge (ii) Post-Treatment (iii) pH of treated water (iv) Bacteria  
(v) Hardness removal (vi) Economy. (06 Marks)
- b. Explain :  
(i) Reverse osmosis (ii) Nano-filtration (06 Marks)
- c. Discuss :  
(i) Super-chlorination (ii) Break-point Chlorination (iii) Dechlorination  
Results of chlorine demand test on a raw water are given below Table 7(c). Sketch a "Chlorine demand curve". Determine the "break point dosage" and the "chlorine demand" at dosage of 1.2 mg/l.

Table 7(c)

Sample No.	Chlorine dosage (mg/l)	Residual chlorine after 10 minutes contact (mg/l)
1	0.2	0.19
2	0.4	0.36
3	0.6	0.50
4	0.8	0.48
5	1.0	0.2
6	1.2	0.4
7	1.4	0.6
8	1.6	0.8

(08 Marks)

OR

- 8 a. Discuss the various forms of chlorine that can be used in disinfection process. (06 Marks)  
 b. With a sketch explain the Nalgonda Technique of defluorination of water. (06 Marks)  
 c. The analysis of a hard water shows the following composition.  
 Free  $\text{CO}_2 = 3 \text{ mg/l}$   
 Alkalinity = 68 mg/l  
 Non-carbonate hardness = 92 mg/l  
 Total magnesium = 15 mg/l  
 Assume that it is possible to remove all but 35 mg/l of carbonate hardness with lime and that the treated water is to have a total hardness of 80 mg/l. Determine the quantity of hydrated lime and soda required for treatment per million litre of raw water.  
 (Atomic weights in gms : Ca = 40, Mg = 24, C = 12, O = 16, H = 1, Na = 23 ) (08 Marks)

Module-5

- 9 a. Explain the types of distribution systems. (06 Marks)  
 b. Discuss the factors influencing the selection of pipe materials. (06 Marks)  
 c. Water has to be supplied to a town with one lakh population at the rate of 150 litres per capita per day from a river 2 kms away. The difference in elevation between the lowest water level in the sump and the reservoir is 36m. If the demand has to be supplied in 8 hours, determine size of the main and BHP of the pumps required. Assume maximum demand as 1.5 times the average demand, coefficient of friction of pipe material = 0.0075, Velocity = 2.4 m/sec, Efficiency of pump = 80%. (08 Marks)

OR

- 10 a. Define "economical diameter" of a rising main. Discuss how is it determined. (04 Marks)  
 b. Explain the post fire hydrant and fresh fire hydrant in a water distribution system. (06 Marks)  
 c. It is proposed to construct a distribution reservoir for the water supply of rural population with daily requirement of 2,25,000 litres. The pattern of draw-off is as follows:  
 7 A.M. to 8 A.M. – 30% of days supply  
 8 A.M. to 5 P.M. – 35% of days supply  
 5 P.M. to 6.30 P.M. – 30% of days supply  
 6.30 P.M. to 7 A.M. – 5% of days supply  
 Pumping has to be done at a constant rate of 8 hours per day (from 8 A.M. to 4 P.M.).  
 Estimate the storage of capacity of the reservoir by drawing the mass curve of demand. (10 Marks)

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# CBCS SCHEME

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18CV51

## Fifth Semester B.E. Degree Examination, June/July 2023 Construction Management and Entrepreneurship

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. What are the functions of management? Explain any three of them. (08 Marks)  
b. Draw the network from the following activity and find critical path and total project duration: (08 Marks)

Activity	P	Q	R	S	T	U	V
Predecessor	-	-	P	P	Q	Q	S, T
Duration days	12	11	11	10	9	13	7

- c. Differentiate between autocrat and democrat management styles. (04 Marks)

### OR

- 2 a. A project consists of the following activities. Draw the network diagram, calculate EST, EFT, LST, LFT,  $F_T$  and  $F_F$ . (08 Marks)

Activity	10-20	10-30	20-40	30-40	20-50	40-50
Duration (days)	13	12	2	8	15	2

- b. Explain in brief the different types of project plans used in construction industry. (08 Marks)  
c. What is work break down structure? Mention its uses. (04 Marks)

### Module-2

- 3 a. What are the factors affecting labour productivity in construction industry? Briefly explain. (08 Marks)  
b. Calculate time required to grade and finish 50 km of road formation with width equal to thrice the width of the motor grader, using six passes of the motor grader with speed for each of the successive two passes as 6 km/h, 8 m/h and 10 km/h respectively. Assume machine efficiency based on operators skill, machine characteristics and working conditions as 80%. (08 Marks)  
c. Discuss the class of labour in construction project. (04 Marks)

### OR

- 4 a. Briefly explain the points to be considered for selection of construction equipments. (08 Marks)  
b. A company has purchased an equipment for Rs.1,50,000 with an estimated life of 10 years. The estimated salvage value of the equipment at the end of its lifetime is Rs.25,000. Determine the depreciation charge and book value at the end of various years using the declining balance method of depreciation by assuming 0.2 for K. (08 Marks)  
c. List out the functions of material management. (04 Marks)

### Module-3

- 5 a. Define quality and describe quality control and quality assurance in construction. (08 Marks)  
b. What are the safety measures to be adopted during drilling and blasting? (08 Marks)  
c. Briefly explain concepts of HSE application to construction industry. (04 Marks)

OR

- 6 a. Explain safety through legislation, safety campaign and insurances. (08 Marks)  
 b. Define morals, values and ethics. (06 Marks)  
 c. Briefly write about (i) Gifts and bribes (ii) Whistle blowing (06 Marks)

**Module-4**

- 7 a. What is engineering economy? Explain the principles of engineering economics. (08 Marks)  
 b. An engineer has two bids for an excavator to be installed in a new building. The details of the bids for the excavator are as follows:

Bid	Engineer's Estimate		
	Initial Cost (Rs.)	Service Life (years)	Annual Operations & Maintenance Cost (Rs.)
Company A	10,50,000	15	60,000
Company B	11,00,000	15	70,500

Determine which bid should be accepted, based on the present worth method of comparison assuming 18% interest rate, compounded annually. (12 Marks)

OR

- 8 a. Define the following terms related to engineering economics:  
 (i) Present worth (ii) Future worth (08 Marks)  
 (iii) Opportunity cost (iv) Capitalized cost  
 b. Determine the effective interest rate for a nominal annual rate of 8% that is compounded:  
 (i) Daily (ii) Monthly (iii) Quarterly (iv) Semi annually (12 Marks)

**Module-5**

- 9 a. Explain the function of entrepreneur. (08 Marks)  
 b. What are the objectives and MSME? (04 Marks)  
 c. Explain the role of MSME in economic development. (08 Marks)

OR

- 10 a. Explain different types of feasibility study carried out to start business. (08 Marks)  
 b. What are the different ways to entry into international business? Explain any two ways. (08 Marks)  
 c. Write a short note on role and functions of KIADB. (04 Marks)

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# CBCS SCHEME

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18CV52

**Fifth Semester B.E. Degree Examination, June/July 2023**

## Analysis of Indeterminate Structures

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any, may be suitably assumed.**

### Module-1

- 1 Analyse and draw BMD and SFD for the continuous beam shown in Fig.Q1 by slope deflection method.

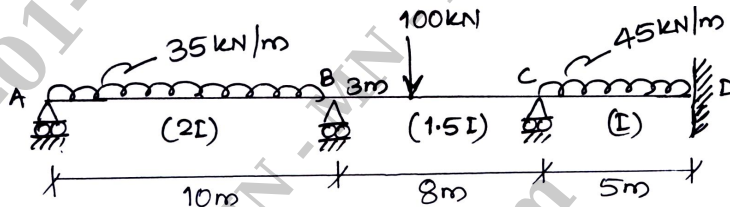


Fig.Q1

(20 Marks)

OR

- 2 Analyse and draw BMD for the rigid frame shown in Fig.Q2 by slope deflection method.

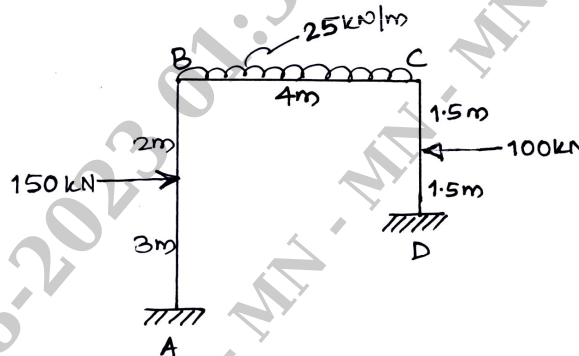


Fig.Q2

(20 Marks)

### Module-2

- 3 Analyse and draw BMD and SFD for the continuous beam shown in Fig.Q3 by moment distribution method.

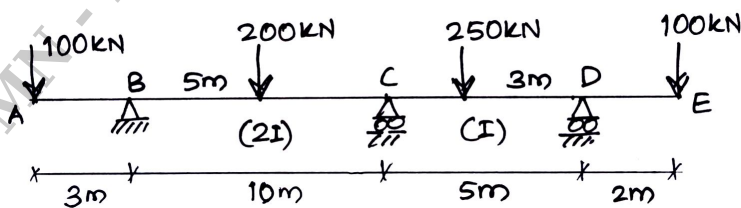


Fig.Q3

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.



OR

- 4 Analyse the portal frame shown in Fig.Q4 by moment distribution method and draw BMD.

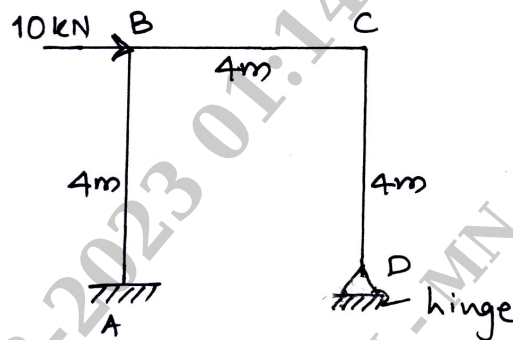


Fig.Q4

(20 Marks)

**Module-3**

- 5 Analyse the continuous beam shown in Fig.Q5 by Kani's method and draw BMD.

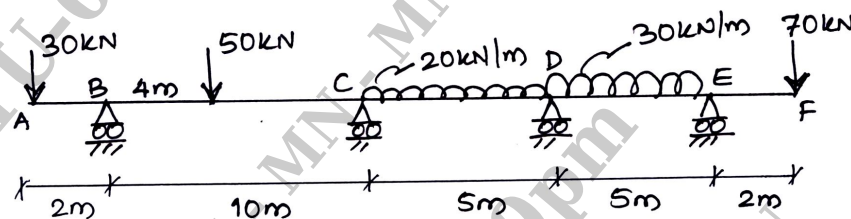


Fig.Q5

(20 Marks)

OR

- 6 Analyse the portal frame shown in Fig.Q6 by Kani's method and draw BMD.

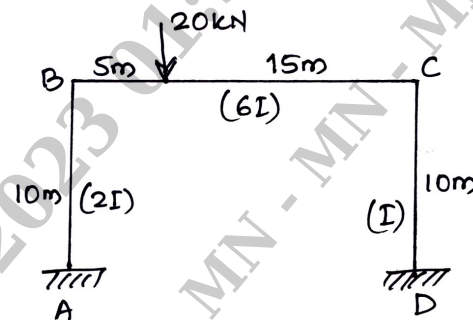


Fig.Q6

(20 Marks)

**Module-4**

- 7 Analyse the continuous beam shown in Fig.Q7 by matrix flexibility method and draw BMD and SFD. Take moments as redundant. (Use system approach).

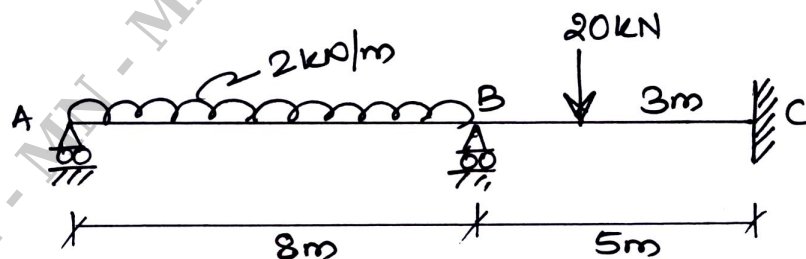


Fig.Q7

(20 Marks)

OR

- 8 Analyse the rigid frame shown in Fig.Q8 by matrix flexibility method using system approach. Take reaction at 'D' as redundant.

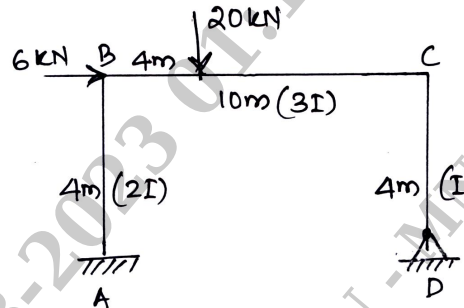


Fig.Q8

(20 Marks)

**Module-5**

- 9 Analyse the continuous beam shown in Fig.Q9 by matrix stiffness method using system approach and draw BMD.

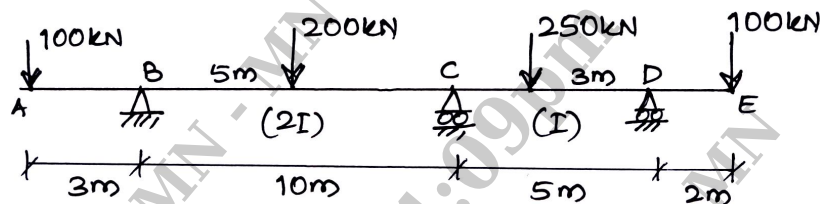


Fig.Q9

(20 Marks)

OR

- 10 Analyse the pin-jointed truss shown in Fig.Q10, by matrix stiffness method using system approach. Take  $E = \text{constant}$  for all members. The values in parenthesis indicates c/s area of members.

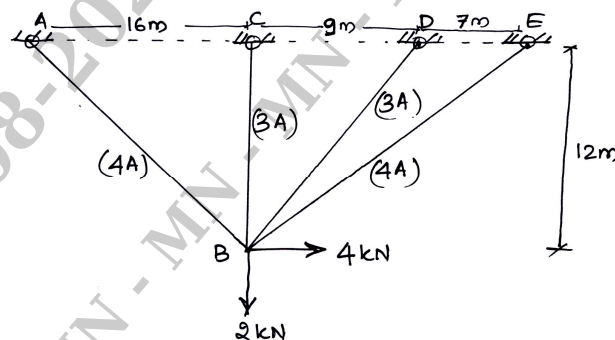


Fig.Q10

(20 Marks)

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## Fifth Semester B.E. Degree Examination, June/July 2023 Design of RC Structural Elements

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS456-2000 and SP(16) is permitted.  
3. Assume Suitable additional data, if necessary.

### Module-1

- 1 a. Distinguish between : i) Balanced section ii) Under reinforced section and iii) Over reinforced section with sketches. Which section is preferable and why? (10 Marks)  
b. What is stress block? Derive from the fundamentals the expression for the area of stress block  $0.36 f_{ck} b x_u$  and depth of centre of compressive force from the extreme fibre in compression  $0.42 \times x_u$ . (10 Marks)

OR

- 2 a. Explain : i) Short term deflection ii) Long term deflection iii) Side face reinforcement. (09 Marks)  
b. A cantilever of 3.5m span is 300mm wide and 600mm deep. It is subjected to a maximum bending moment of 125kN-m due to uniformly distributed service loads of which 50% moment is due to permanent loads. The beam is reinforced with 4 bars of 20mm diameter at an effective cover of 50mm in the tension zone. Determine the immediate deflection. Grades of concrete and steel  $M_{20}$  and  $Fe_{415}$ . (11 Marks)

### Module-2

- 3 a. A singly reinforced beam (RCC) of 250mm  $\times$  450mm deep upto the center of reinforcement with 3 - #16 at an effective cover of 50mm, effective span of 6m.  $M_{20}$  concrete and  $Fe_{415}$  steel. Determine the central point load that can be carried/supported in addition to the self weight. (12 Marks)  
b. Determine the moment of resistance of a T-beam for the following data :  
Effective depth = 400mm, Breadth of the flange = 740mm, Breadth of web = 240mm, Area of steel = 5 -# 20 and depth of flange = 110mm. Adopt  $M_{20}$  grade concrete and  $Fe_{415}$  steel. (08 Marks)

OR

- 4 a. A doubly reinforced beam section is 300mm wide and 500mm deep to the centre of tensile reinforcement. It is reinforced with compression reinforcement of  $300\text{mm}^2$  at an effective cover of 50mm and tension reinforcement of  $1800\text{mm}^2$ . Determine the safe moment of resistance of the section.  $M_{20}$  grade concrete and  $Fe_{500}$  grade steel is used. (12 Marks)  
b. A Tee beam has the following data:  
i) C/C spacing of beams = 3.2mt  
ii) Simply supported effective Span = 8m  
iii) Depth of slab = 150mm  
iv) Size of web of beam = 300mm  $\times$  500mm  
Calculate the balanced moment of resistance. (08 Marks)

**Module-3**

- 5 a. Brief about codal provisions made in providing longitudinal and lateral reinforcement in beams. (05 Marks)
- b. A simply supported rectangular beam is supported on 300mm wide walls. Over a clear span of 6mtrs. Design the beam by using M<sub>25</sub> grade concrete and Fe 415 Grade steel, superimposed load on beam is 15kN/m and breadth of beam is 230mm. (15 Marks)

**OR**

- 6 a. What is Torsion? Write expression for equivalence bending moment and equivalent shear force for members subjected to torsion. (04 Marks)
- b. Design a intermediate T – beam for a hall measuring 6.5m × 12m (clear dimension). Beams are spaced at 3m C/C. Depth of slab is 150mm. superimposed live load on slab is 4.0kN/m<sup>2</sup> finishes is 1.0kN/m<sup>2</sup>, Check for deflection also use M<sub>20</sub> grade concrete and HYSD bar of Fe 500 grade. Sketch the reinforcement details. (16 Marks)

**Module-4**

- 7 Design an RC slab for a room measuring 4m × 5m inside. The slab carries a live load of 2kN/m<sup>2</sup> and is finished with 20mm topping of unit weight 24kN/m<sup>3</sup>. The slab is simply supported on all four edges with corners free to lift, No need to check for shear, Use M<sub>20</sub> concrete and Fe 415 steel. (20 Marks)

**OR**

- 8 Design a dog legged stair for an office floor room measuring 2.8m × 5.8m, clear vertical distance between the floors is 3.6m. The width of height is to be 1.25 m. Assume imposed load of 3kN/m<sup>2</sup>. Use M<sub>20</sub> concrete and Fe 415 grade steel. Assume that the stairs are supported on 230mm width support at the outer edges of landing slabs. Sketch the reinforcement detail. Design of one height is enough. (20 Marks)

**Module-5**

- 9 A corner column 400×400mm is subjected to a factored loads  $P_u = 1300\text{kN}$ ,  $M_{ux} = 190\text{kN/m}$  and  $M_{uy} = 110\text{kN/m}$ . Design the reinforcement in the column, assuming M<sub>25</sub> concrete and Fe415 steel and effective cover of 60mm. Assume it as a short column. (20 Marks)

**OR**

- 10 Design a square footing for a short axially loaded column of size 300mm×300mm carrying 600kN load. Use M20 concrete and Fe 415 steel. SBC of soil is 180kN/m<sup>2</sup>. Sketch the details of reinforcement. (20 Marks)

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## Fifth Semester B.E. Degree Examination, June/July 2023 Basic Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Define the following terms with the help of a phase diagram.
  - i) Voids ratio
  - ii) Porosity
  - iii) Degree of saturation
  - iv) Specific gravity (06 Marks)
- b. Derive the relationship between Porosity and Voids ratio with usual notations. (04 Marks)
- c. One cum of wet soil weights 20kN, it's dry weight is 18kN specific gravity of solids is 2.67. Determine water content, Porosity, Voids ratio and degree of saturation. Draw the phase diagram. (10 Marks)

**OR**

- 2 a. 500 grams of dry soil was subjected to sieve analysis. The weight of soil retained on each sieve is as follows :
 

IS sieve Size	Wt of soil Grams	Is Sieve Size	Wt of soil Grams
4.75mm	10	212 $\mu$	40
2mm	165	150 $\mu$	30
1mm	100	75 $\mu$	50
425 $\mu$	85		

Plot the grain size distribution curve and determine the following :

  - i) Percentage Gravel ( $\geq 4.75\text{mm}$ )
  - ii) %sand ( $4.75 - 0.075\text{mm}$ )
  - iii) % silt and clay ( $<0.075\text{mm}$ )
  - iv) Effective size
  - v) Uniformity coefficient ( $C_u$ ) and coefficient of curvature ( $C_c$ ) (12 Marks)
- b. Draw the volume Vs water content for a fine strained soil and explain various Atterberg limits (04 Marks)
- c. Explain any 2 methods of field identification of soils. (04 Marks)

### Module-2

- 3 a. Name the three clay minerals. Explain the structure of each of them. (06 Marks)
- b. Differentiate between Flocculent and Dispersed structures in soil, with the help of diagram. (04 Marks)
- c. During a compaction test, a soil attains a maximum dry density of  $18\text{kN/m}^3$  at a water content of 12%. Determine the degree of saturation and % an voids at maximum dry density. Also find theoretical maximum dry density corresponding to zero air voids at optimum water content.  $G = 2.67$ . (10 Marks)

OR

- 4 a. What is field compaction control and how it is achieved. (04 Marks)  
 b. Differentiate between standard proctor test and modified standard proctor test. (10 Marks)

The following data refers to a compaction test as per Indian standard (light compaction)

Water content (%)	8.5	12.2	13.75	15.5	18.2	20.2
Weight of wet sample (Kg)	1.5	1.94	2.00	2.05	2.03	1.98

Volume of the mould = 1000CC and specific gravity  $G = 2.7$

Plot i) Compaction curve and obtain MDD and OMC

ii) Plot 80% and 100% saturation line

(06 Marks)

**Module-3**

- 5 a. List the factors that influence permeability of soils and mention the manner in which they do so. (08 Marks)  
 b. A horizontal stratified soil deposit consists of three layers each uniform in itself. The permeability of three layers are  $8 \times 10^{-4}$  cm/sec,  $52 \times 10^{-4}$  cm/sec and  $6 \times 10^{-4}$  cm/sec and their thickness are 7m, 3m and 10m respectively. Find the effective average permeability of the deposit in horizontal and vertical directions. (06 Marks)  
 c. List the characteristics of flow nets. (06 Marks)

OR

- 6 a. In a falling head test the time taken for fall in head from  $h_1$  to  $h_2$  is equal to that from  $h_2$  to  $h_3$ . Deduce the relation between  $h_1$ ,  $h_2$  and  $h_3$ . (06 Marks)  
 b. A sand deposit consists of 2 layers. The top layer is 2.5m thick ( $r = 17.1 \text{ kN/m}^3$ ) and bottom layer is 3.5m thick ( $r_{\text{sat}} = 20.65 \text{ kN/m}^3$ ). The water table is at a depth of 3.5m from the surface and the zone of capillary saturation is 1m above water table. Show a dimensional sketch and plot variation of final, neutral and effective stress. (09 Marks)  
 c. Define discharge velocity and seepage velocity of flow through soils and derive the relation between them. (05 Marks)

**Module-4**

- 7 a. An unconfined compression test was conducted on an undisturbed sample of clay. The sample has diameter of 37.5mm and was 80mm long. The load at failure measured by the proving ring was 28N and the axial deformation of the sample at failure was 13mm. Determine the unconfined compressive strength and undrained shear strength of clay. (06 Marks)  
 b. Explain the classification of shear strengths based on drainage conditions. (06 Marks)  
 c. CU triaxial tests conducted on specimens of a saturated clay soil gave the following results.

Cell pressure $\sigma_3 (\text{kN/m}^2)$	Deviator stress $\sigma_d (\text{kN/m}^2)$	Pure water pressure at failure ( $\text{kN/m}^2$ )
150	102	80
300	200	164
450	304	246
600	405	325

Determine the effective stress strength parameters  $C'$  and  $Q'$  by Mohr circle method.

(08 Marks)

**OR**

- 8 a. State the advantages and disadvantages of direct shear test. (05 Marks)
- b. In a direct shear test, on a sand sample the normal stress was  $200\text{kN/m}^2$ . Draw the Mohr's circle and the strength envelope. Determine : (10 Marks)
- i) the angle of shearing resistance
  - ii) the magnitude of the major and minor principal stress
  - iii) Orientation of the principal stresses.
- c. Explain in brief Mohr-Coulomb failure criteria in soils. (05 Marks)

**Module-5**

- 9 a. Explain spring analogy to illustrate consolidation of soils. (06 Marks)
- b. The time taken to reach 40% consolidation of a two way drained laboratory sample 10mm thick saturated clay sample is 35sec. Determine the time required for 60% consolidation of the same soil 10m thick on the top of a rock surface subjected to same loading conditions on the laboratory sample. (08 Marks)
- c. Explain in detail how pre consolidation pressure is determined from Casagrande's method (06 Marks)

**OR**

- 10 a. What are the Assumptions and Limitations of Terzaghi's one dimensional consolidation theory? (06 Marks)
- b. Explain in brief normally consolidated, under consolidated and over consolidated soils. (06 Marks)
- c. Explain in detail square root of time fitting method to determine coefficient of consolidation of soil. (08 Marks)

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# CBCS SCHEME

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18CV55

## Fifth Semester B.E. Degree Examination, June/July 2023 Municipal Wastewater Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain necessity and importance of sanitation. (06 Marks)  
b. Discuss the methods for estimating the storm water. (08 Marks)  
c. Define time of concentration and explain the methods to calculate the  $t_c$ . (06 Marks)

OR

- 2 a. Explain the shapes of sewers with sketches. (08 Marks)  
b. Explain the procedure for laying of sewers on ground and different types of test for sewer water tightness. (06 Marks)  
c. With the sketch enumerate the principle of house drainage work. (06 Marks)

### Module-2

- 3 a. With appropriate equations, explain self cleaning and non scouring velocity in sewers and their importance. (06 Marks)  
b. Discuss the hydraulic characteristics for a circular sewer running partial full conditions. (06 Marks)  
c. The rain sewer was designed for an area of 50 km<sup>2</sup>. Density of population of the town is 200 persons/hectares. The average flow is 250 lpcd. The peak discharge is one and half times more than average flow. Rainfall equivalent of 8 mm in 24 hours all of which is runoff:  
(i) What is capacity of sewer? (ii) Find minimum velocity and gradient. Take sewage containing sand of 1 mm dia, sewer dia 35 cm,  $s = 2.65$ ,  $K = 0.06$ ,  $f = 0.03$ . Manning's  $n = 0.012$ . (08 Marks)

OR

- 4 a. Explain the sampling techniques and method for collection sewage samples. (06 Marks)  
b. Discuss the physical, chemical characteristics of sewage. (06 Marks)  
c. Explain the process of waste water treatment for municipal waste with flow diagram. (08 Marks)

### Module-3

- 5 a. Explain the bar screen with the sketches. (06 Marks)  
b. Briefly explain the different types of grit chamber. (08 Marks)  
c. Enumerate the design considerations of settling tank. (06 Marks)

OR

- 6 a. Discuss self purification process and oxygen sag curve with neat sketch. (08 Marks)  
b. What are the methods of sewage application on land and explain sewage farming? (08 Marks)  
c. A town having population of 50,000 and the rate of water supply as 160 l/day, disposes off its sewage successfully by land treatment. The area of land available is 180 hectares. If 80% of water supplied is converted into sewage. Find out the consuming capacity of soil. Consider 50% as extra area for rotation. (04 Marks)



**Module-4**

- 7 a. Explain process involved in trickling filter with neat sketch. (06 Marks)  
b. Explain the activated sludge process with flow diagram. (08 Marks)  
c. What are the stages anaerobic sludge digestion? Explain with sketch. (06 Marks)

**OR**

- 8 a. Explain mechanism of purification in stabilization ponds with sketches. (08 Marks)  
b. Explain process in oxidation ditches and advantages and disadvantages. (08 Marks)  
c. Discuss the functions of sludge drying beds and different components. (04 Marks)

**Module-5**

- 9 a. Explain advanced oxidation process for waste water treatment. (08 Marks)  
b. Discuss the process of electro coagulation for advanced waste water treatment. (06 Marks)  
c. Explain the process of nitrification and dinitrification. (06 Marks)

**OR**

- 10 a. Explain low cost treatment of sewage. (05 Marks)  
b. With the sketch, explain the components of septic tank. (10 Marks)  
c. Discuss the functions of ECO toilet and soak pit. (05 Marks)

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# CBCS SCHEME

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18CV56

## Fifth Semester B.E. Degree Examination, June/July 2023 Highway Engineering

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Mention different modes of Transportation. Explain the characteristics of road transport in comparison with other systems. (10 Marks)
- b. 3 New Roads R1, R2 and R3 are to be completed in a District during five year period. Using the data given below workout the order of priority for placing the plan program by the principle of maximum utilities per unit length. Adopt utility unit of 0.5 < 2000 , 1.0 for 2000 – 5000 and 2.0 for > 5000 , 1.0 for 1000 t of agricultural product and 1.0 for 100 t of Industrial products. (10 Marks)

Road	Length	No. of Villages served population			Productivity 1000 tonnes	
		< 2000	2000-5000	> 5000	Agriculture	Industries
R1	15	10	8	3	15	1.2
R2	12	16	3	1	11	0.0
R3	18	20	10	2	20	0.8

OR

- 2 a. Write short note on :  
i) NHDP ii) PMGSY iii) KSHIP iv) KRDC. (10 Marks)
- b. List out the factors affecting alignment and explain important stages of Engineering Survey of Highway Alignment. (10 Marks)

### Module-2

- 3 a. Explain briefly two important surface characteristics influencing Highway Geometric Design. (10 Marks)
- b. The speeds of overtaking and overtaken vehicles are 70 and 40 kmph respectively on a two way traffic road. The average acceleration during overtaking operation is assumed as  $0.99\text{m/sec}^2$ .  
i) Calculate safe overtaking sight distance.  
ii) What is the minimum length of overtaking zone?  
iii) Draw a neat sketch of overtakes zone indicating the positions of sign posts. (10 Marks)

OR

- 4 a. Enlist the gradients encountered in vertical Alignment and explain briefly. (10 Marks)
- b. A vertical summit curve is formed at the intersection of 2 gradients , +3.0% and -5.0%. Design the length of summit curve to provide a SSD for a design speed of 80 kmph. Assume missing data suitably. (10 Marks)

### Module-3

- 5 a. With a neat sketch, illustrate conduction of Plate Load test to determine modulus of subgrade reaction. (10 Marks)
- b. List the desirable properties of Bitumen and tests to be conducted on Bitumen. (10 Marks)

OR

- 6 a. Draw and explain the Component part and functions of each component of Flexible and Rigid pavement. (10 Marks)
- b. The CBR test results are as follows. Apply correction and determine the CBR value of the soil. (10 Marks)

Load in kgs	0	2	4	9	20	34	49	74	92	118	125
Penetration in mm	0	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	7.5	10.0

**Module-4**

- 7 a. Briefly outline the design procedure of soil aggregate mixes by Ruth fatch method.(10 Marks)
- b. Enumerate the requirements , specification of materials and construction steps for Wet Mix Macadom (WMM). (10 Marks)

OR

- 8 a. Explain briefly the construction procedure of Bitumen concrete (BC) with Quality control checks as per MORTH. (10 Marks)
- b. List the quality checks on Cement Concrete Pavement (PQC) carried out both in the laboratory and at field. (10 Marks)

**Module-5**

- 9 a. Explain the significance and requirements of a Highway Drainage System. (10 Marks)
- b. Explain with sketches, how the subsurface drainage system is provided to lower the GWT. (10 Marks)

OR

- 10 a. Explain the following with respect to Highway Financing : (10 Marks)
- i) BOT ii) BOOT iii) VOC.
- b. Calculate the annual cost of a stretch of Highway from the following particulars :

Item	Total cost Rs. in lakhs	Estimated life, years	Rate of interest, %
Land	35.0	100	6
Earth work	40.0	40	8
Bridges, culvert and drainage	50.0	60	8
Pavement	100.0	15	10
Traffic signs and Road Items	15.0	5	10

The average cost of maintenance of the road is Rs 1.5 lakhs per year.

(10 Marks)

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# CBCS SCHEME

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18CV61

## Sixth Semester B.E. Degree Examination, June/July 2023 Design of Steel Structural Elements

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Assume any missing data.  
3. Use of IS:800-2007 and steel tables are permitted.*

### Module-1

- a. Mention the failure criteria of steel with examples. Explain any one in brief. (10 Marks)  
b. What are the advantages and disadvantages of using steel structures? Mention different types of RS sections using construction. (10 Marks)

OR

- a. Define shape factor and determine the plastic and section modulus of a built up section as shown in Fig.Q2(a).

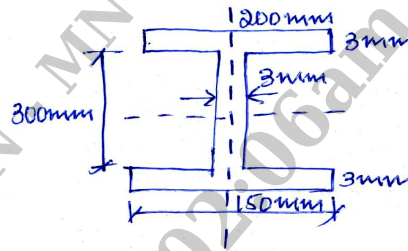


Fig.Q2(a)

(10 Marks)

- b. Determine the plastic moment capacity for the beam loaded as shown in Fig.Q2(b).

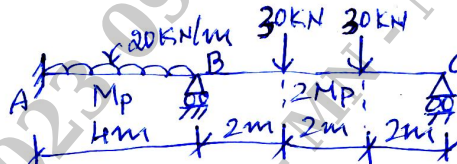


Fig.Q2(b)

(10 Marks)

### Module-2

- a. Mention any four advantages and disadvantages of HSFG bolts and also explain various modes of failure of bolted connection. (08 Marks)  
b. Design a bolted connection between the flange of a column ISHB450@907 N/m and a bracket plate 15 mm thick. The bracket plate is supporting a load of 150 kN at an eccentricity of 350 mm. Adopt HSFG bolts of property class 8.8. (12 Marks)

OR

- a. Mention any four advantages and disadvantages of welding. Explain common defects in welding with neat sketch. (10 Marks)  
b. Determine the size and effective length of the side fillets to connect two plates with cross sections of 150×10mm and 100×10mm subjected to a tension of 150 kN (Working load). (10 Marks)

**Module-3**

- 5 a. Explain the possible modes of failure of axially loaded columns. (04 Marks)  
 b. Design the member consists of a single angle to carry a tensile force of 200 kN. The length of tension member is 3.5m and subjected to reversal stresses due to wind forces. If the yield strength and the ultimate strength of the steel used are 250 MPa and 410 MPa and use M<sub>18</sub> grade bolt. (16 Marks)

**OR**

- 6 a. Define Lacing and batten system with neat sketch. (03 Marks)  
 b. Design a laced column with two channels back to back of length 8m to carry an axial factored load of 1000 kN. The column is hinged at both ends. (17 Marks)

**Module-4**

- 7 a. Define Lug angle. Where lug angles are provided? (03 Marks)  
 b. Design the end connection for ISA 100×100×10 mm using lug angle for its full design strength. Use M<sub>20</sub> bolts, property class 4.6. Provide yield stress of steel 250 MPa. Sketch the connection details. (17 Marks)

**OR**

- 8 a. Explain the types of column bases. (04 Marks)  
 b. Design a slab base for an ISHB350@661.2 N/m column to carry a factored load of 1000 kN. M<sub>25</sub> concrete and Fe415 grade steel is used for the foundation. (16 Marks)

**Module-5**

- 9 a. What are the factors which affects lateral stability? (03 Marks)  
 b. Design a cantilever beam which is built into concrete wall and carrying a load of 25 kN/m and live load of 10 kN/m. The span of beam is 5m. (17 Marks)

**OR**

- 10 a. Explain briefly  
 i) Laterally Unsupported beams  
 ii) Column splices (06 Marks)  
 b. Design a simply supported I section to support the slab of a hall of 9m × 24m with beams spaced at 3m c/c. Slab is of 100mm thick. Consider floor finish load of 0.5 kN/m<sup>2</sup> and live load of 3 kN/m<sup>2</sup>. Use F<sub>y</sub> = 250 MPa steel. Assume adequate lateral support to the compression flange. Also check for deflection. (14 Marks)

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# GBCS SCHEME

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18CV62

## Sixth Semester B.E. Degree Examination, June/July 2023 Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS:6403 is permitted.*

### Module-1

- 1 a. What is subsurface exploration? Enumerate the objectives of subsurface exploration. (10 Marks)
- b. Explain seismic refraction method with neat sketch. What are its limitations? (10 Marks)

OR

- 2 a. Establish the location of ground water in a Clayey strata, water in bore is bailed out to a depth of 12m below ground surface and rise of water recorded at 24 hr interval are  $h_1 = 60\text{cm}$ ,  $h_2 = 55\text{cm}$ ,  $h_3 = 50\text{cm}$ . (10 Marks)
- b. What are the methods available for dewatering? Explain dewatering by electro osmosis method with neat sketch. (10 Marks)

### Module-2

- 3 a. Derive Boussinesq expression for vertical stress due to concentrated load. When  $r/z$  ratio is zero what is the value of Boussinesq influence co-efficient? (10 Marks)
- b. A concentrated load of 50 kN acts on the surface of a homogeneous soil mass of large extent. Determine the stress intensity at a depth of 5m, directly under the load and at a horizontal distance of 2.5m. Use Boussinesq analysis. (08 Marks)
- c. What is Isobar? (02 Marks)

OR

- 4 a. There is a layer of soft clay 4m thick under a newly constructed building. The overburden pressure at the centre of the clay layer is  $300 \text{ kN/m}^2$ . Compute the settlement if there is an increase in pressure due to construction of  $1000 \text{ kN/m}^2$ . Take  $C_c = 0.5$ ,  $G = 2.7$  and water content  $\omega = 50\%$ . (10 Marks)
- b. Explain the classification of foundation settlement. What are the other causes of settlement? (10 Marks)

### Module-3

- 5 a. What are the causes of slope failure? List and enumerate the types of failure in finite slopes. (10 Marks)
- b. A new canal is excavated to a depth of 5m below group level through a soil having the characteristics as,  $C = 14 \text{ kN/m}^2$ ,  $\phi = 15^\circ$ ,  $e = 0.8$  and  $G = 2.7$ . The slope of banks is 1 in 1. If the Taylors stability number is 0.083, calculate the factor of safety with respect to cohesion when the canal runs full. If it is suddenly emptied, what will be the factor of safety? Take Taylor's stability number as 0.122. (10 Marks)

OR

- 6 a. Explain the procedure of Culmann's graphical method for active earth pressure. (10 Marks)  
 b. A retaining wall with a stratified backfill and a surcharge load is shown in the Fig.Q6(b). Draw the earth pressure diagram. Also estimate the resultant thrust on the wall and its position.

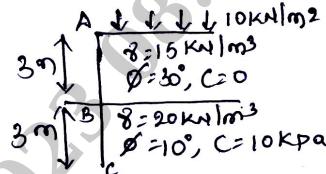


Fig.Q6(b)

(10 Marks)

Module-4

- 7 a. Explain standard penetration test and its correction. (10 Marks)  
 b. A strip footing 2m wide carries a load intensity of  $400 \text{ kN/m}^2$  at a depth of 1.2m in sand. The saturated unit weight of sand is  $19.5 \text{ kN/m}^3$  and unit weight above water table is  $16.8 \text{ kN/m}^3$ . The shear strength parameters are  $C = 0$  and  $\phi = 35^\circ$ . Determine the factor of safety with respect to shear failure for the following cases of location of water table.  
 i) Water table is 4 m below Ground Level.  
 ii) Water table is 2.5 m below Ground Level. (10 Marks)

OR

- 8 a. Explain the effect of water table on bearing capacity of soil. (10 Marks)  
 b. A square footing  $2.5\text{m} \times 2.5\text{m}$  is built on homogeneous bed of sand of density  $19 \text{ kN/m}^3$  and having angle of shearing resistance of  $36^\circ$ . The depth of foundation is 1.5m below ground surface. Calculate safe load that can be applied on the footing with factor of safety 3. Take bearing capacity factors as  $N_c = 27$ ,  $N_q = 30$  and  $N_\gamma = 35$ . (10 Marks)

Module-5

- 9 a. List the classification of piles based on different criteria. Explain with neat sketch classification of piles based on function. (10 Marks)  
 b. In a 16 pile group, the pile diameter is 45 cm and centre to centre spacing of the square group is 1.5m. If  $C = 50 \text{ kN/m}^2$ , determine whether the failure would occur with the pile acting individually or as a group? Neglect bearing at the tip of the pile. All piles are 10m long. Take  $m = 0.7$  for shear mobilization around each pile. (10 Marks)

OR

- 10 Write short notes on :  
 a. Efficiency of pile group  
 b. Negative Skin friction  
 c. Under-reamed pile  
 d. Settlement of pile group (20 Marks)

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# CBCS SCHEME

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18CV63

## Sixth Semester B.E. Degree Examination, June/July 2023 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. With neat sketch, explain the engineering representation of the hydrological cycle. (10 Marks)  
b. Thiessen polygon constructed for a network of the rain gauges in river basin yielded theissen weights of 0.10, 0.16, 0.12, 0.11, 0.09, 0.08, 0.07, 0.11, 0.06, 0.10. If the rainfall recorded for these gauges during a cyclonic storm are 132, 114, 162, 138, 207, 156, 135, 158, 168 and 150 mm respectively. Determine the average depth rainfall by theissen mean and arithmetic mean methods, also determine the value of surface runoff at the basin outlet. If 35% of the rainfall is lost as infiltration. Take the area of the basin as 5000 km<sup>2</sup> and express the answer in million cubic meter. (10 Marks)

OR

- 2 a. Explain with neat sketch how its amount is measured using Symon's raingauge. (10 Marks)  
b. List and explain the types of precipitation. (10 Marks)

### Module-2

- 3 a. (i) Explain with neat sketch the measurement using class A pan. (06 Marks)  
(ii) Write the Rohwer's formula and explain its term. (04 Marks)  
b. Briefly explain the measurement of Evapo-transpiration. (10 Marks)

OR

- 4 a. What is evaporation? Explain its factor affecting. (10 Marks)  
b. Write a short notes on: (i) AET (ii) PET (10 Marks)

### Module-3

- 5 a. Define hydrograph. With a neat sketch, explain components parts of hydrograph. (10 Marks)  
b. Derive the UHG for the catchment of 200 km<sup>2</sup> if the following discharge was observed in stream as a 6 hr rainfall storm. The base flow can be assumed to have increase linearly.

Time	0	3	6	9	12	15	18	21	24	27
6 hr discharge (m <sup>3</sup> /s)	5	110	265	230	165	30	95	70	55	50
Base flow (m <sup>3</sup> /s)	5	10	15	20	25	30	35	40	45	50

(10 Marks)

OR

- 6 a. Explain the rainfall runoff relationships using regression analysis. (10 Marks)  
b. Derive the S-curve for the 4 hr UHG given below:

Time (Hr)	0	4	8	12	16	20	24	28
Ordinates in 4 hr UHG (m <sup>3</sup> /s)	0	10	30	25	18	10	5	0

(10 Marks)



**Module-4**

- 7 a. A water course has a culturable command area of 1200 hectares. The intensity of irrigation for crop A is 40% and for B is 35% and both the crops are rabi crops. Crop A has a kore depth of 10 cm and kore period of 10 days and crop B has kore depth of 16 cm and kore period of 15 days. Calculate the discharge of water course. (10 Marks)
- b. What are Duty, Delta and Base period? Explain factors affecting duty of waters. (10 Marks)

**OR**

- 8 a. A channel is to be design for irrigating 5000 hectares in Kharif crop and 4000 hectares in rabi crop. The water requirement for Kharif and rabi are 60 cm and 25 cm respectively. The kore period of Kharif is 3 weeks and for rabi is 4 weeks. Determine the discharge of the channel for which it is to be designed. (10 Marks)
- b. What is flow irrigation and lift irrigation? Explain the Bandhara irrigation. (10 Marks)

**Module-5**

- 9 a. Define canal. Explain different types of canal based on alignment. (10 Marks)
- b. Find the section and maximum discharge of a channel with the following data:  
 Bed slope = 1 in 5000  
 Lacey's silt factor = 0.95  
 Side slope = 1:1 (10 Marks)

**OR**

- 10 a. Define reservoir. With a neat sketch, explain zones of storage in a reservoir. (10 Marks)
- b. Design an irrigation channel with the following data:  
 (i) Full supply discharge = 6 cumex  
 (ii) Rugosity coefficient,  $N = 0.0225$   
 (iii) CVR (m) = 1  
 (iv) Bed slope = 1 in 5000  
 Assume other reasonable data for the design. (10 Marks)

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# CBCS SCHEME

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18CV643

## Sixth Semester B.E. Degree Examination, June/July 2023 Alternate Building Materials

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain the concept of energy embodied in building materials. (10 Marks)  
b. Explain the role of construction industry in global warming. (10 Marks)

OR

- 2 a. List out the various environmental friendly and cost effective building technologies. Explain any one in brief. (10 Marks)  
b. What are the advantages of LEED? List out the five main credit categories in LEED rating system. (10 Marks)

### Module-2

- 3 a. Write a note on:  
i) Fal G blocks  
ii) Laterite blocks. (10 Marks)  
b. List and explain properties of Good Mortar. (10 Marks)

OR

- 4 a. Explain the method of manufacturing stabilized mud block. (10 Marks)  
b. A brick masonry prism is made up of 6 brick's joined by mortar of thickness 2cm the brick is 8cm in thickness. The prism is subjected to a uniform vertical stress of 5MPa. The brick has a modulus of 800MPa and the mortar has a modulus of 900MPa. Determine the horizontal lateral stress in brick and mortar. Assume the Poisson's ratio of brick and mortar = 0.1. (10 Marks)

### Module-3

- 5 a. Write the properties and uses of time pozzolana cement. (10 Marks)  
b. List out the different methods employed in manufacturing of F.R.P and explain any one in brief. (10 Marks)

OR

- 6 a. List out the different agro and industrial waste. Explain their use as building material. (10 Marks)  
b. Explain application of FRP composites. (10 Marks)

**Module-4**

- 7 a. List out the advantages and disadvantages of Mivan construction techniques. (10 Marks)  
b. Explain the process of constructing masonry domes and vaults. (10 Marks)

**OR**

- 8 a. What are the materials used Ferro cement? Explain its construction method in brief. (10 Marks)  
b. What are the primary functions of a roof? Explain briefly the various roofing alternative. (10 Marks)

**Module-5**

- 9 a. What are the advantages and disadvantages of manufacturing concrete term R.M.C plants. (10 Marks)  
b. What is the meaning of precast elements? What are the advantages of precast concrete? (10 Marks)

**OR**

- 10 a. Write a note on :  
i) Types of concrete mixers  
ii) Cast concept in building. (10 Marks)  
b. What are the equipments used for producing stabilized blocks? Explain them in brief. (10 Marks)

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# CBGS SCHEME

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18CV651

**Sixth Semester B.E. Degree Examination, June/July 2023**

## **Remote Sensing and GIS**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### **Module-1**

- 1 a. What is Remote Sensing? Explain the advantages and limitations of Remote Sensing. (06 Marks)
- b. Explain the process of Remote Sensing with neat sketch. (06 Marks)
- c. Describe the electromagnetic spectrum with a neat sketch. (08 Marks)

**OR**

- 2 a. Briefly explain how energy interactions with earth feature i.e soil, water and vegetation occurs in remote sensing with neat sketches. (10 Marks)
- b. Define visual interpretation technique? List and explain in brief the elements of visual interpretation techniques. (10 Marks)

### **Module-2**

- 3 a. Explain the different types of platforms used in remote sensing with their applications. (10 Marks)
- b. Describe the different types of sensors used in remote sensing, and their sensors characteristics. (10 Marks)

**OR**

- 4 a. Explain the detail about the digital image processing. (10 Marks)
- b. Explain in detail the image enhancements and image filtering techniques used in Remote sensing. (10 Marks)

### **Module-3**

- 5 a. Define Geographic Information system. Describe the key components of GIS with neat sketch. (08 Marks)
- b. Explain how spatial data and Attribute data integrated to make GIS. (06 Marks)
- c. Explain in detail the UTM zones used in GIS. (06 Marks)

**OR**

- 6 a. What are Map projections? Explain the various map projection methods in brief with neat sketch. (10 Marks)
- b. Write a note on :
- i) Geographically referenced data
- ii) Projected coordinate systems. (10 Marks)

**Module-4**

- 7 a. Explain the components of Raster data and vector data models with traditional advantages and disadvantages and basic differences between them. (10 Marks)
- b. Explain Topological models of vector data overlay concept. (10 Marks)

**OR**

- 8 a. What things can be represented in point, line and polygon? Explain field based vector model. (08 Marks)
- b. Describe Raster data GIS models with sketch. (08 Marks)
- c. Explain spaghetti model. (04 Marks)

**Module-5**

- 9 a. Explain the applications of remote sensing in water resources management. (10 Marks)
- b. Describe the application of remote sensing and GIS in natural resources management system. (10 Marks)

**OR**

- 10 a. Explain role of remote sensing and GIS in urban planning and traffic management. (10 Marks)
- b. What are the applications of remote sensing in land use/land cover analysis? Briefly explain. (10 Marks)

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**Seventh Semester B.E. Degree Examination, June/July 2023**  
**Design of RCC and Steel Structures**

Time: 3 hrs.

Max. Marks:100

**Note:1. Answer any TWO full questions, selecting at least ONE questions from each module.**  
**2. Use of Is 456, Is – 800 SP(16) and Steel tables are permitted.**

**Module-1**

- 1 Two columns (230 × 300) and (300 × 230) are spaced 2m apart and carry loads of 280kN and 350kN (service loads) respectively. If the SBC of soil is  $140\text{kN/m}^2$ . Design a rectangular combined footing, the projection of the footing beyond centre line of column carrying lowest load is limited to 500mm. Use M20 grade of concrete and Fe-415 grade steel. (50 Marks)

**OR**

- 2 Design a cantilever retaining wall to retain an earth embankment with a horizontal 3.5m above ground level. Density of earth =  $19\text{ kNm}^3$ . Angle of internal friction =  $\phi = 30^\circ$  safe bearing capacity of soil =  $200\text{ kN/m}^2$ . The co-efficient of friction between soil and concrete is 0.5. Adopt M<sub>20</sub> grade of concrete and Fe-415 grade steel. (50 Marks)

**Module-2**

- 3 Design a bolted roof truss for an industrial building as shown in Fig.Q3, consider M<sub>16</sub> bolts of property class 4.6. Also design the support for a pull of 40 kN. The forces are as given in Table Q.3 (50 Marks)

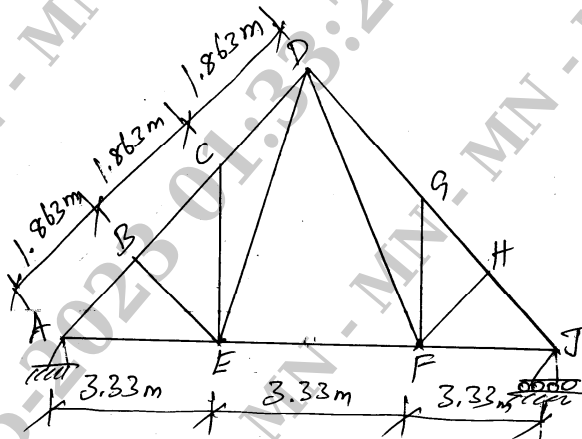


Fig.Q3

Member	DL(kN)	LL(kN)	WL(kN)
AB	+14.37	+21.80	-37.32
BC	+11.64	+17.60	-32.08
CD	+12.05	+18.26	-35.90
DE	-5.13	-7.70	+14.70
EC	+2.77	+4.18	-8.42
EB	+2.77	+4.18	-9.15
EA	-12.85	-19.36	+31.69
EF	-7.69	-11.61	+15.63

Sign : + Compression

- Tension

Table Q3

1 of 2

OR

- 4 A welded plate girder has an effective span of 36m and carries a uniformly distributed load of 79.5kN/m and two concentrated load of 870 kN. Each acting at 9m from both ends. The girder is simply supported at ends. It is fully restrained at both ends against lateral buckling throughout the span. Design the plate girder using this web and stiffeners. Also design the welded connection between flange and web, end bearing stiffeners and web. Take yield stress of steel =  $f_y = 250$  MPa, ultimate stress of steel =  $f_u = 415$  MPa. Ultimate shear stress of weld = 410 MPa. (50 Marks)

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# CBCS SCHEME

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18CV745

## Seventh Semester B.E. Degree Examination, June/July 2023 Urban Transport Planning

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define Urbanization and explain the causes of Urbanization. (10 Marks)
- b. Explain the classification of transit systems with examples. (10 Marks)

OR

- 2 a. Explain the "System approach" to urban transport planning using a flow chart. (10 Marks)
- b. What is mass transit system? Compare BRTS and Metro rails. (10 Marks)

### Module-2

- 3 a. Explain zoning. What are the important points to be kept in mind while dividing the area into zones? (10 Marks)
- b. Define study area and explain external cordon line. (10 Marks)

OR

- 4 a. Explain (i) Home Interview Surveys (ii) Commercial Vehicle Surveys. (10 Marks)
- b. What are secondary sources of data in transport planning? Explain any two. (10 Marks)

### Module-3

- 5 a. What is multilinear regression analysis and list the assumptions made. (10 Marks)
- b. List and explain factors Governing trip generation and attraction rates. (10 Marks)

OR

- 6 a. Define "Category Analysis". What are the assumptions to be made in category analysis? (10 Marks)
- b. The distribution of present trips among the zones 1, 2, 3 are given in the OD matrix below. The future trips generated in zones 1, 2 and 3 are expected to be 360, 1260 and 3120 respectively. It is required to distribute the future trips among the zones.

O \ D	1	2	3
1	60	100	200
2	100	20	300
3	200	300	20

Using Uniform Growth Factor method and list disadvantages of this method. (10 Marks)



**Module-4**

- 7 a. What is trip distribution and mention the methods of trip distribution. (10 Marks)  
 b. The total trips produced in and attracted to the three zones A, B and C of a survey are in the design year are tabulated as below:

Zone	Trips produced	Trip Attracted
A	2000	3000
B	3000	4000
C	4000	2000

It is known that the trips between two zones are inversely proportional to the second power of the travel time between zones, which is uniformly 20 minutes. If the trip interchange between zones B and C is known to be 600. Calculate the trip interchange between zones A and B, A and C, B and A, C and B. (10 Marks)

OR

- 8 a. With a neat flowchart explain model split carried out between trip generation and trip distribution. (10 Marks)  
 b. Write a short note on (i) Desire line diagram (ii) Gravity model. (10 Marks)

**Module-5**

- 9 a. Define trip assignment and explain the various applications of trip assignment. (10 Marks)  
 b. Mention the different assignment techniques. Explain any one. (10 Marks)

OR

- 10 a. Explain in detail the features of the Lowry Model. (10 Marks)  
 b. Write a brief note on Diversion Curves. (10 Marks)

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# GBCS SCHEME

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18CV81

## Eighth Semester B.E. Degree Examination, June/July 2023 Design of Pre-Stressed Concrete

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS 1343 is permitted.*

### Module-1

- 1 a. With a neat sketch explain Pretensioning and Post-tensioning system. List out the difference between them [any three]. (08 Marks)
- b. Define Anchorage. Explain with sketch Freyssinet system of Post-tensioning. (06 Marks)
- c. Explain the need for High Strength Concrete and High Strength Steel for Prestressed concrete member. (06 Marks)

OR

- 2 a. Define Pressure line. Plot the pressure line for a simply supported rectangular beam of size  $b \times h$  subjected load and prestressed by force "P" at a constant eccentricity of "h/6" such that bottom fibre stress at mid-span due to all load and "P" equal to "Zero". (06 Marks)
- b. An unsymmetrical I-section beam is used to support an imposed load of 2 kN/m over a span of 8m. The sectional details are top flange, 300mm wide and 60mm thick; bottom flange, 100mm wide and 60mm thick; thickness of web = 80 mm; overall depth of beam = 400mm. At the centre of the span, the effective prestressing force of 100 kN is located at 50mm from the soffit of the beam. Estimate the stresses at the centre of span section of the beam for the following load condition.
  - i) Prestress + Self weight
  - ii) Prestress + Self weight + Live load. (14 Marks)

### Module-2

- 3 a. Define losses of Prestress. Explain the different losses of Prestress encountered in the Pretensioning and Post-tensioning system. (08 Marks)
- b. A pretensioned beam, 200 × 300mm is prestressed by 10 wires of 7mm diameter initially stressed to 1200N/mm<sup>2</sup>, with their centroids located 100mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. If the concrete undergoes a further shortening due to creep and shrinkage while there is a relaxation of five percent of steel stress. Estimate the final percentage loss of stress in the wires using IS 1343 regulations and following data:  
 $E_s = 210\text{kN/mm}^2$  ;  $E_c = 5700 (f_{cu})^{1/2}$  ;  
 $f_{cu} = 42 \text{ N/mm}^2$  ; Creep co-efficient  $\phi = 1.6$   
Total residual shrinkage strain =  $3 \times 10^{-4}$ . (12 Marks)

OR

- 4 a. Derive the quantification of deflection due to the effect of parabolic tendon profile having eccentricity "e" at the centre and zero at support. (06 Marks)
- b. What are the factors affecting deflection of PSC beam. (04 Marks)

- c. A concrete beam with a symmetrical I-section has flange width and depth  $200 \times 60$  mm. Thickness of web is 80mm and overall depth is 400mm. The beam is prestressed by a cable carrying a force of 1000 kN. The span of the beam is 8m. The centre line of the cable is 150mm from the soffit of the beam at the centre of span, linearly varying to 250mm at the supports. Compute the initial deflection at mid-span due to prestress and the self-weight of the beam, assuming  $E_c = 38 \text{ kN/mm}^2$ . Compare the deflection with the limiting deflection permitted in IS:1343 [ $\gamma_c = 24 \text{ kN/m}^3$ ]. (10 Marks)

### Module-3

- 5 a. A post-tensioned bridge girder with unbounded tendons is of box section of overall dimensions 1200mm wide by 1800mm deep with wall thickness of 150mm. The high-tensile steel has an area of  $4000 \text{ mm}^2$  and is located at an effective depth of 1600mm. The effective prestress in steel after all losses is  $1000 \text{ N/mm}^2$  and the effective span of the girder is 24m. If  $f_{ck} = 40 \text{ N/mm}^2$  and  $f_p = 1600 \text{ N/mm}^2$ . Estimate the ultimate flexural strength of the section. (10 Marks)
- b. A pretensioned prestressed beam having a rectangular section, 150 mm wide and 300mm deep has an effective cover of 50mm. If  $f_{ck} = 40 \text{ N/mm}^2$ ,  $f_p = 1600 \text{ N/mm}^2$ , and the area of prestressing steel  $A_p = 461 \text{ mm}^2$ . Calculate the ultimate flexural strength of the section using IS:1343 code provision. (10 Marks)

### OR

- 6 a. Explain the different types of flexural failure observed in PSC members. (06 Marks)
- b. Determine the effective prestress area of prestressing steel and the area of the section from preliminary design for a simply supported Type I prestressed beam with  $M_T = 435 \text{ kNm}$  (Including an estimated  $M_{sw} = 55 \text{ kNm}$ ). The height of the beam is restricted to 920 mm. The prestress at service  $f_{pe} = 860 \text{ N/mm}^2$ . The allowable compressive stress of concrete at service is  $11 \text{ N/mm}^2$ .

Type of prestressing tendon = 7 wires strand

Nominal diameter = 12.8 mm

Nominal area =  $99.3 \text{ mm}^2$

(14 Marks)

### Module-4

- 7 a. Explain the types of shear cracks in PSC. List the different ways of improving the shear resistances by prestressing technique. (08 Marks)
- b. A concrete beam having a rectangular section  $150 \times 300$ mm is prestressed by a parabolic cable having an eccentricity of 100mm at the centre of span, reducing to zero at the supports. Span of beam is 8m. The beam supports a live load of  $2 \text{ kN/m}$ . Determine the effective force in the cable to balance the dead and live loads on the beam. Estimate the principle stresses at the support section. (12 Marks)

### OR

- 8 A PSC beam of symmetrical I-section has overall depth of 2m. Thickness of web is 200mm. Effective span is 40m. The beam is prestressed by cables which are concentric at supports and have eccentricity of 750mm at centre span. Force in the cable is 1200 kN at the transfer stage,  $f_{ck} = 60 \text{ N/mm}^2$ . Estimate the ultimate shear resistance at support due to loads is 2834 kN and loss ratio is 0.8, design the suitable shear reinforcement using Fe415 steel. Area of section is  $0.88 \times 10^6 \text{ mm}^2$ . (20 Marks)

**Module-5**

- 9 a. Explain the terms i) End Block stress distribution ii) Bursting tension with reference to post-tensioned prestressed members. (06 Marks)
- b. The end blocks of a prestressed concrete girder is 200mm wide by 300mm deep. The beam is post-tensioned by two Freyssinet anchorages each of 100mm diameter with their centres located at 75mm from the top and bottom of beam. The force transmitted by each anchorage being 2000 kN. Compute the bursting force and design suitable reinforcement according to the IS:1343 code. (14 Marks)

**OR**

- 10 The end block of a post-tensioned prestressed member is 550 mm wide and 550mm deep four cables, each made up of seven wires of 12mm diameter strands and carrying a force of 1000 kN, are anchored by plate anchorages, 150×150mm, located with their centres at 125mm from the edges of the end block. The cable duct is of 50mm diameter. The 28 days cube strength of concrete  $f_{cu} = 45 \text{ N/mm}^2$ , The cube strength at transfer  $f_{ci} = 25 \text{ N/mm}^2$ . Permissible bearing stresses behind anchorage should conform with IS:1343. The characteristic yield stress in mild steel anchorage reinforcement is  $260 \text{ N/mm}^2$ . Design suitable anchorage for the end block. (20 Marks)

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# CBCS SCHEME

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18CV824

## Eighth Semester B.E. Degree Examination, June/July. 2023 Rehabilitation and Retrofitting

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define distress of concrete. Explain the causes of distress in concrete in brief. (10 Marks)  
b. Describe the mechanism of plastic and drying Shrinkage and also enlist the precautionary measures. (10 Marks)

OR

- 2 a. Define durability of concrete. Explain the effect of carbonation and alkali action on durability of concrete. (10 Marks)  
b. Discuss the evaluation procedure for a concrete structure damaged due to earthquake. (10 Marks)

### Module-2

- 3 a. Explain the damage assessment procedure with a flow chart. (10 Marks)  
b. Describe Rebound hammer and penetration resistance test for assessing the strength of concrete structure. (10 Marks)

OR

- 4 a. Discuss the purpose and general procedure for investigation of damaged concrete structure. (10 Marks)  
b. Distinguish the types of testing systems for hardened concrete and also describe the method of load test for assessing the strength of in-situ concrete member. (10 Marks)

### Module-3

- 5 a. Explain the effects of climate and temperature actions on durability of concrete structure. (10 Marks)  
b. Define Corrosion. Explain the corrosion mechanism in reinforced concrete with a neat sketch. (10 Marks)

OR

- 6 a. Discuss the influence of design and construction errors on durability of concrete. (10 Marks)  
b. Describe corrosion inhibitors and cathode protection techniques for preventing corrosion of reinforcements. (10 Marks)

### Module-4

- 7 a. Define Maintenance. Describe the facts and importance of maintenance. (10 Marks)  
b. Explain the detail restoration of column by Jacketing technique with sketches. (10 Marks)

OR

- 8 a. Describe the types and necessities of maintenance. (10 Marks)  
b. Explain External bonding and near surface mounted technique in detail (10 Marks)

Module-5

- 9 a. Discuss the different types of fibers and their roles as a repair material. (10 Marks)  
b. Describe the types of chemical admixture for repair of cracks. (10 Marks)

OR

- 10 a. Explain different types of mortars for repair of cracks. (10 Marks)  
b. Describe Guniting shotcreting methods as repair techniques. (10 Marks)

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# CBCS SCHEME

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21MAT31

## Third Semester B.E. Degree Examination, Jan./Feb. 2023 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Find the Laplace transform of  $te^{2t} - \frac{2 \sin 3t}{t}$ . (06 Marks)
- b. Given that  $f(t) = \begin{cases} E, & 0 < t < a/2 \\ -E, & a/2 < t < a \end{cases}$   
where  $f(t+a) = f(t)$  show that  $L\{f(t)\} = \frac{E}{s} \tanh\left(\frac{as}{4}\right)$ . (07 Marks)
- c. Using convolution theorem obtain the inverse Laplace transform of the following function : (07 Marks)  
$$\frac{1}{(s-1)(s^2+1)}$$

OR

- 2 a. Find the inverse Laplace transform of : (06 Marks)  
$$\frac{s+5}{s^2-6s+13}$$
- b. Express the following function in terms of unit step function and hence find their Laplace transform.  
$$f(t) = \begin{cases} 1, & 0 < t < 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2. \end{cases}$$
 (07 Marks)
- c. Solve the following initial value problem by using Laplace transform : (07 Marks)  
$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}, y(0) = 0, y'(0) = 0.$$

### Module-2

- 3 a. Obtain Fourier series of  $f(x) = \frac{\pi-x}{2}$  in  $0 < x < 2\pi$ . Hence deduce that (06 Marks)  
$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$$
- b. Find a cosine Fourier series for  $f(x) = (x-1)^2, 0 \leq x \leq 1$ . (07 Marks)
- c. Obtain the Fourier series of  $y$  upto the First harmonic for the following values.

$x^\circ$	45	90	135	180	225	270	315	360
$y$	4.0	3.8	2.4	2.0	-1.5	0	2.8	3.4

(07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8=50, will be treated as malpractice.

OR

- 4 a. Obtain Fourier series for

$$f(x) = \begin{cases} \pi x & \text{in } 0 \leq x \leq 1 \\ \pi(2-x) & \text{in } 1 \leq x \leq 2 \end{cases} \quad (06 \text{ Marks})$$

- b. Obtain the sine half range series for the function :

$$f(x) = 1 - \left(\frac{x}{\pi}\right) \text{ in } 0 \leq x \leq \pi. \quad (07 \text{ Marks})$$

- c. The following values of y and x are given. Find Fourier series of upto first harmonics.

x	0	2	4	6	8	10	12
y	9.0	18.2	24.4	27.8	27.5	22.0	9.0

(07 Marks)

**Module-3**

- 5 a. If
- $f(x) = \begin{cases} 1-x^2, & |x| < 1 \\ 0, & |x| \geq 1 \end{cases}$
- . Find Fourier transform of f(x) and hence find the value of

$$\int_0^{\infty} \frac{x \cos x - \sin x}{x^3} dx. \quad (06 \text{ Marks})$$

- b. Find the Fourier sine transform of
- $f(x) = e^{-|x|}$
- and hence evaluate

$$\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx, \quad m > 0. \quad (07 \text{ Marks})$$

- c. Solve by using Z-Transforms
- $U_{n+2} + 2U_{n+1} + U_n = n$
- with
- $U_0 = 0 = U_1$
- . (07 Marks)

OR

- 6 a. Obtain the Fourier cosine transform of the function :

$$f(x) = \begin{cases} 4x, & 0 < x < 1 \\ 4-x, & 1 < x \leq 4 \\ 0, & x > 4. \end{cases} \quad (06 \text{ Marks})$$

- b. Obtain the Z-transform of
- $\cos n\theta$
- and
- $\sin n\theta$
- (07 Marks)

- c. Compute the inverse Z-transform of
- $\frac{3z^2 + 2z}{(5z+1)(5z+2)}$
- . (07 Marks)

**Module-4**

- 7 a. Classify the following partial differential equations :

i)  $x^2 u_{xx} + (1-y^2) u_{yy} = 0, \quad -\infty < x < \infty, -1 < y < 1$

ii)  $(1+x^2) u_{xx} + (5+2x^2) u_{xt} + (4+x^2) u_{tt} = 0$

iii)  $(x+1) u_{xx} - 2(x+2) u_{xy} + (x+3) u_{yy} = 0. \quad (10 \text{ Marks})$

- b. Solve
- $u_t = u_{xx}$
- subject to the conditions
- $u(0, t) = 0 = u(1, t)$
- and
- $u(x, 0) = \sin(\pi x)$
- by taking
- $h = 0.2$
- for 5 levels. Further write down the following values from the table

i)  $u(0.2, 0.04)$

ii)  $u(0.4, 0.08)$

iii)  $u(0.6, 0.06).$

(10 Marks)



OR

- 8 a. Solve the elliptic equation  $u_{xx} + u_{yy} = 0$  for the following square Mesh with boundary values as shown. Find the iterative values of  $u_i$  (1 to 9) to the nearest integer.

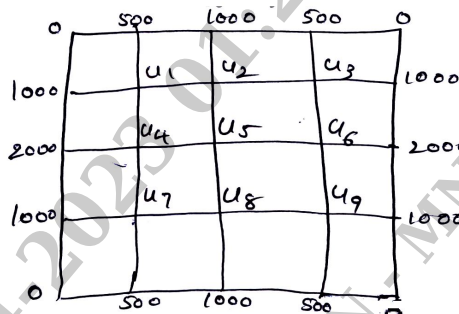


Fig.Q8(a)

- (10 Marks)
- b. Solve  $25u_{xx} = u_{tt}$  at the pivotal points given  $u(0, t) = 0 = u(5, t)$ ,  $u(x, 0) = 0$  and  $u(x, 0) = \begin{cases} 20x, & 0 \leq x \leq 1 \\ 5(5-x), & 1 \leq x \leq 5 \end{cases}$  by taking  $h = 1$  compute  $u(x, t)$  for  $0 \leq t \leq 1$ . (10 Marks)

**Module-5**

- 9 a. Given  $y'' - xy' - y = 0$  with the initial conditions  $y(0) = 1$ ,  $y'(0) = 0$  compute  $y(0.2)$  using fourth order Runge - Kutta method. (06 Marks)
- b. Derive the Euler's equation. (07 Marks)
- c. Find the extremal of the functional. (07 Marks)
- $$\int_{x_1}^{x_2} (y^2 + y'^2 + 2ye^x) dx.$$

OR

- 10 a. Obtain the solution of the equation  $2 \frac{d^2 y}{dx^2} = 4x + \frac{dy}{dx}$  by computing the value of  $y(1.4)$  by applying Milne's method using following data :

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y'	2	2.3178	2.6725	3.0657

- (06 Marks)
- b. Find the curve on which the functional  $\int_0^1 [(y')^2 + 12xy] dx$  with  $y(0) = 0$  and  $y(1) = 1$  can be determined. (07 Marks)
- c. Prove that the shortest distance between two points in a plane is straight line. (07 Marks)

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# CBCS SCHEME

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21CV32

## Third Semester B.E. Degree Examination, June/July 2023 Geodetic Engineering

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Assume any missing data suitably and state the same clearly.

### Module-1

- 1 a. Explain briefly about i) Principles of surveying ii) Different types of meridians used for determining the bearings of lines. (08 Marks)  
b. The bearings of a closed traverse sides AB, BC, CD, DE and EA are as shown in Table. Q1(b). Calculate the interior angles of the traverse. (06 Marks)

Table Q1(b)

Side	Fore bearing	Back bearing
AB	107° 15'	287° 15'
BC	22° 0'	202° 0'
CD	281° 30'	101° 30'
DE	189° 15'	9° 15'
EA	124° 45'	304° 45'

- c. Explain briefly about advantages and disadvantages of plane table surveying. (06 Marks)

### OR

- 2 a. Explain briefly about i) Importance of surveying in Civil Engineering ii) Magnetic dip, Magnetic declination and Local attraction. (08 Marks)  
b. Determine the angle between the lines OA and OB, if their respective bearings are as described below for three different cases : (06 Marks)  
i) 32° 15' and 148° 45' ii) 16° 10' and 332° 18' iii) 126° 12' and 300° 15'  
c. Explain briefly with procedure about three point problem in plane table survey. (06 Marks)

### Module-2

- 3 a. Explain briefly about profile levelling and cross sectioning and their uses in Civil Engineering projects. (06 Marks)  
b. The following data as shown in Table Q3(b), were recorded from 4.00m levelling staff with dumpy level between two main stations 'A' and 'B'. The bench mark of station 'A' is 520.450m. Determine the reduced level of station 'B' and conduct the necessary arithmetic checks. (07 Marks)

Table Q3(b)

Sl.No.	Description about leveling staff reading
1.	First reading at 'A' = 0.585
2.	Reading before changing Dumpy level = 3.940
3.	Reading after changing Dumpy level = 0.960
4.	Reading before changing Dumpy level = 3.845
5.	Reading after changing Dumpy level = 0.955
6.	Reading at 'B' = 3.015

- c. The following perpendicular offsets were taken at 10.00m intervals from a survey line to an irregular boundary line : 3.82m, 4.37m, 6.82m, 5.26m, 7.59m, 8.90m, 9.52m, 8.42m and 6.43m. Determine the area enclosed between the survey line, irregular boundary line and the first and last offsets by i) Simpson's rule ii) Trapezoidal rule. (07 Marks)

## OR

- 4 a. Explain briefly about i) Procedure for determining the area of an irregular figure by using planimeter ii) Temporary adjustments for levelling instruments. (08 Marks)
- b. The reduced level of the floor in a building is 100.595m. The reading recorded by placing leveling staff on the floor is 1.795m and placing the leveling upside down below the Soffit of the roof beam is 2.295m. Determine the reduced level of the soffit of the roof beam and height of the soffit of the roof beam with respect to floor level. (05 Marks)
- c. Determine the volume of earth embankment for the data given in Table. Q4(c) by Prismoidal rule and Trapezoidal rule. (07 Marks)

Table Q4(c)

Chainage along centre line of embankment in m.	Cross section area of embankment in m <sup>2</sup> .
0.00	0.00
30.00	150.00
60.00	155.00
90.00	153.00
120.00	156.00
150.00	148.00
180.00	152.00
210.00	154.00
240.00	157.00

**Module-3**

- 5 a. Explain briefly about measuring horizontal angle from theodolite by repetition method and state what errors will be eliminated by this method. (06 Marks)
- b. Theodolite was set over station 'P' which is an temporary bench mark of reduced level 832.000m. Height of horizontal axis of the theodolite above the temporary bench mark is 1.250m. The readings recorded through stadia hair of the theodolite by placing levelling staff at station Q in vertical position is 1.200m, 1.930 and 2.650 respectively with angle of elevation as 9° 30'. Determine the distance PQ and reduced level of station Q. Consider the multiplier constant as 100 and additive constant as 0.30 for the theodolite. (06 Marks)
- c. Determine the elevation of the top of the chimney point 'Q' from two instrument stations 'P' and 'R' spaced at a horizontal distance of 100m between them. The base of point 'Q' is in accessible. Stations 'P', 'R' and the point 'Q' are in one single vertical plane. The angle of elevation of point 'Q' measured from the stations 'P' and 'R' were 28° 42' and 18° 6' respectively. The leveling staff was placed in the bench mark and the readings recorded from stations 'P' and 'R' were 2.870 and 3.750m respectively. The reduced level of the bench mark is 287.280m. Determine the elevation of the top of the chimney point 'Q'. (08 Marks)

## OR

- 6 a. Explain briefly about temporary and permanent adjustments of theodolite. (06 Marks)
- b. Explain briefly about determining distance and elevations using Tacheometric method. (06 Marks)
- c. Determine the elevation of top of the building point 'Q' from two stations 'P' and 'R', spaced at 60.00m between them by double plane method. The horizontal angle measured at station 'P' between 'R' and 'Q' were found to be 60° 30' and angle of elevation measured from station 'P' to 'Q' was 10° 12'. The horizontal angle measured at station 'R' between 'P' and 'Q' were found to be 68° 18' and the angle of elevation measured from 'R' to 'Q' was found to be 10° 48'. Leveling staff was placed on bench mark having reduced level value of 435.065m. The readings recorded on leveling staff from the stations 'P' and 'R' were found to be 1.965m and 2.055m respectively. Consider the bore of Q as inaccessible. (08 Marks)

**Module-4**

- 7 a. Explain briefly about i) Different types of circular curves ii) Transition curves iii) Vertical curves along with their applications. (06 Marks)
- b. Calculate the required data for setting out a simple curve from the method of offsets from the long chord. The radius of the curve is 100m, deflection angle is  $60^\circ$  and consider the peg interval along the long chord as 10m. (06 Marks)
- c. Calculate the necessary data for setting out a simple circular curve of radius 600m to connect two straights intersecting at a chainage of 3605.00m by Rankine's method, using theodolite of one second accuracy. Consider the deflection angle as  $25^\circ$  and peg interval as 30m. (08 Marks)

**OR**

- 8 a. A transition curve is to be provided for a circular curve of radius 300m. Calculate the length of transition curve required for the condition of rate of gain in acceleration as  $0.50\text{m/s}^3$  and speed of the vehicle a 50 K.M.P.H. (04 Marks)
- b. Two tangents intersect at chainage 1190.00m. Calculate the data necessary for setting out a simple curve of radius 300m, having deflection angle of  $36^\circ$  by offsets from chords produced. Consider the peg interval as 30m. (06 Marks)
- c. Explain briefly about different components of a compound curve with the aid of neat figure and describe a detailed procedure for setting out the compound curve by Rankine's method. (10 Marks)

**Module-5**

- 9 a. Explain briefly about various methods used for plotting map details in aerial surveying. (06 Marks)
- b. Explain briefly about remote sensing and how it differs from photogrammetry survey. (07 Marks)
- c. Explain briefly about i) Total station ii) Electronic distance measuring systems, along with their applications. (07 Marks)

**OR**

- 10 a. Explain briefly about different applications of remote sensing. (06 Marks)
- b. Explain the terms : i) Spatial data ii) Raster iii) Vector iv) Geocoding, used in GIS. (07 Marks)
- c. Explain briefly what is GPS and what are its applications. (07 Marks)

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# CBCS SCHEME

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21CV33

## Third Semester B.E. Degree Examination, June/July 2023 Strength of Materials

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Derive an expression for circular tapering bar. (10 Marks)
- b. A steel bar ABCD of varying section is subjected to axial force as shown in Fig.Q1(b). Determine the value of 'P' necessary for equilibrium, if  $E = 20 \text{ kN/mm}^2$ . Find the total elongation of the bar and also stress in each part.

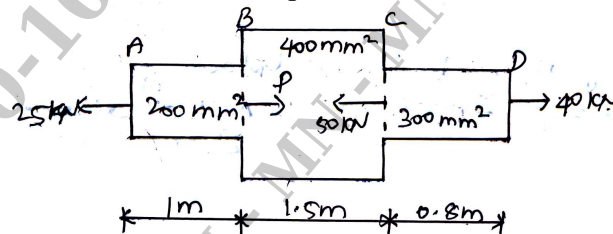


Fig.Q1(b)

(10 Marks)

OR

- 2 a. A load 2 MN is applied on a column  $500 \times 500 \text{ mm}$ . The column is reinforced with 4 steel bars of 10mm diameter one in each corner. Find the stress in concrete and steel bars. Take  $E$  for steel as  $2.1 \times 10^5 \text{ N/mm}^2$  and for concrete as  $1.4 \times 10^4 \text{ N/mm}^2$ . (10 Marks)
- b. A 18mm diameter steel rod passes centrally through a copper tube of 26mm diameter (internal) and 38mm external diameter. The rod is 2.6 m long is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly none on the protecting parts of the rod. If the temperature of assembly is raised by  $80^\circ\text{C}$  calculate thermal stresses induced in copper and steel. Take  $\alpha_{cu} = 17.5 \times 10^{-6}/^\circ\text{C}$ ,  $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$ ,  $E_{st} = 210 \text{ GPa}$ ,  $E_{cu} = 1.05 \times 10^5 \text{ N/mm}^2$ . (10 Marks)

### Module-2

- 3 a. What are the different types of load and supports? Explain the neat sketch. (08 Marks)
- b. Draw BMD and SFD for the beam shown in Fig.Q3(b).

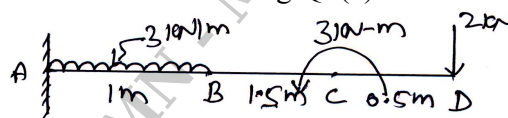


Fig.Q3(b)

(12 Marks)

OR

- 4 a. Derive relationship between loading, shear force and bending moment. (06 Marks)
- b. Draw BMD and SFD for the beam shown in Fig.Q4(b). Indicate maximum bending moment and its location. Also indicate the point of contraflexure.

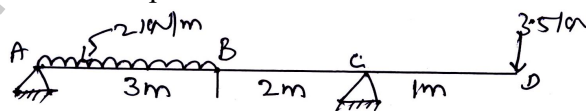


Fig.Q4(b)

(14 Marks)

**Module-3**

- 5 a. What are the assumptions of simple bending? (05 Marks)  
 b. Derive Bernoulli's equation for bending stress. (10 Marks)  
 c. A rectangular beam 250 mm deep and 150mm width is simple supported over a span of 8m. What UDL per meter the beam can carry if the bending stress is not to exceed  $140 \text{ N/mm}^2$ . (05 Marks)

**OR**

- 6 a. Derive an expression for shear stress. (10 Marks)  
 b. A beam with an I-section consists of  $180 \times 15 \text{ mm}$  flanges and curb of 280mm depth and 15mm thickness. It is subjected to a bending moment of 120 kN-m and a shear force of 60 kN. Sketch the bending stress and shear stress distribution along the depth of section. (10 Marks)

**Module-4**

- 7 a. What are the assumptions of pure torsion? (05 Marks)  
 b. Derive torsion equation. (08 Marks)  
 c. A hollow shaft is required to transmit 140 kW at 160 rpm. The total angle of twist in a length of 4m is not to exceed  $2^\circ$  and the shear stress is limited to  $65 \text{ N/mm}^2$ .  $C = 0.8 \times 10^5 \text{ N/mm}^2$ . Determine the inner and external diameter of the shaft. (07 Marks)

**OR**

- 8 a. Show that in a thin cylinder the hoop stress is twice the longitudinal stress. (08 Marks)  
 b. What are the assumptions made in Lamé's equation? Derive Lamé's equation. (12 Marks)

**Module-5**

- 9 a. Differentiate between short and long column. (04 Marks)  
 b. Describe the limitation of Euler's theory. (04 Marks)  
 c. Find Euler's load for a column  $40 \text{ mm} \times 50 \text{ mm}$  C/S and 2m long, if one of its end is fixed and other end is hinged. E for the material of the column is  $200 \text{ N/mm}^2$ . Find Rankine's load in the above case, if the yield stress in compression is  $320 \text{ N/mm}^2$ ,  $\alpha = 1/7500$ . (12 Marks)

**OR**

- 10 a. Derive relationship between slope, deflection and radius of curvature. (10 Marks)  
 b. A simply supported beam spanning 8m carries a concentrated loads of 60 kN and 30 kN at distances of 2m and 4m from left support. Determine  
 (i) the slope at the ends (ii) The location and magnitude of the maximum deflection.  
 Assume  $E = 200 \text{ GPa}$  and  $I = 20 \times 10^8 \text{ mm}^4$ . (10 Marks)

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# CBCS SCHEME

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21CV34

## Third Semester B.E. Degree Examination, June/July 2023 Earth Resources and Engineering

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain the Internal structure and composition of earth with neat sketch. (10 Marks)  
b. Define Landslide. What are the causes for landslide? Write the preventive measures for landslide. (10 Marks)

OR

- 2 a. What is Plate tectonics? Describe different plate boundaries. Add a note on Lithosphere and Asthenosphere. (10 Marks)  
b. What is Earthquake? How they are classified based on causes as well as depth of focus? Describe characteristics of P & S waves. (10 Marks)

### Module-2

- 3 a. Explain physical properties of Minerals , Hardness , Habit , Cleavage Fracture and Streak. (10 Marks)  
b. Define Igneous rocks. Explain classification of Igneous rocks based on Silica percentage and depth of formation. (10 Marks)

OR

- 4 a. Based on physical properties, describe how the rocks can be used as construction material. (10 Marks)  
b. What is an Aquifer? Discuss various aquifer parameters. Add a note on water bearing properties of various geological formations. (10 Marks)

### Module-3

- 5 a. What is Weathering? Describe different types of physical and chemical weathering. (10 Marks)  
b. Describe various erosional and depositional coastal landforms. (06 Marks)  
c. Distinguish between Black cotton soil and Laterite soil. (04 Marks)

OR

- 6 a. Discuss briefly the Geomorphological aspects in the selection of site for dam construction. Add a note on suitable site for Arch dam. (10 Marks)  
b. Discuss various erosional and depositional features of river morphology. Add a note on influence of erosional and depositional process on Civil Engineering Project. (10 Marks)

### Module-4

- 7 a. P, Q and R are test boreholes there sunk at 3 points of an equilateral triangle whose sides are 480m each. P is west of Q and R is north of midpoint of PQ. Boreholes P, Q and R reached the upper surface of a shear zone at 100m, 220m and 260m depth respectively.  
i) Determine strike and dip of the shear zone.  
ii) Another bore hole is sunk at 'T' (midpoint of Q & R). Determine at what depth bore hole T reach the same shear zone. (10 Marks)

- b. Define an Unconformity. Explain various types of an unconformity with neat labeled sketches. (10 Marks)

**OR**

- 8 a. What is a Fault? With a neat sketch, explain Normal and Reverse fault? How the faults can be recognized in the field. (10 Marks)
- b. What is ground improvement technique? Explain the process of rock bolting , rock jointing and grouting. (05 Marks)
- c. Write a short note on effect of joints in a tunnel project. (05 Marks)

**Module-5**

- 9 a. Define Remote Sensing. List the applications of remote sensing in Civil Engineering practices. (08 Marks)
- b. Define GIS. Describe briefly various components of GIS. (08 Marks)
- c. Write a short note on Toposhete and its significance. (04 Marks)

**OR**

- 10 a. Define Photogrametry. Describe briefly the basic attributes of Areal Photographes to be used in photogrametry. (08 Marks)
- b. What is GPS? Describe various segments of GPS. (06 Marks)
- c. What is GPR? Write applications of GPR in Civil Engineering practices. (06 Marks)

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Question Paper Version : A

**Third Semester B.E. Degree Examination, June/July 2023**

## **Infrastructure Finance**

Time: 1 hr.]

[Max. Marks: 50

### **INSTRUCTIONS TO THE CANDIDATES**

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

- 
1. Which of the following credit facilities comes under infrastructure loan?  
a) Transport  
b) Energy  
c) Water and Sanitation  
d) All of these
  2. How much percent of the total assets of the company should be deployed in the infrastructure loans?  
a) 75%  
b) 60%  
c) 80%  
d) 50%
  3. What should be the minimum net worth of a company to get registered as infrastructure Finance Company?  
a) Rs.250 crore  
b) Rs.350 crore  
c) Rs.300 crore  
d) Rs.100 crore
  4. Infrastructure Finance company is engaged in business of which of the following?  
a) Debts  
b) Infrastructure loan  
c) Marketing  
d) None of these
  5. Government owned infrastructure projects are known as,  
a) Social Infrastructure  
b) Public Infrastructure  
c) Institutional Infrastructure  
d) Basic Infrastructure
  6. The central public works department is under the control of which ministry.  
a) Ministry of Rural Development  
b) Ministry of Road Transport & Highways  
c) Ministry of Housing & Urban Affairs  
d) Ministry of shipping
  7. According to the Economic Survey 2019, how much amount should be invested in the infrastructure sector in India, to become a \$5 trillion dollar economy by 2024-25?  
a) \$2 trillion  
b) \$1.5 trillion  
c) \$2.4 trillion  
d) \$1.4 trillion

8. NIP stands for,  
a) National Integration project  
b) National Infrastructure program  
c) National Infrastructure pipeline  
d) New Integrated project
9. What are the IDFs (Infrastructure development funds)?  
a) Funds allocated by central government  
b) Funds invest in companies which are engaged in infrastructure  
c) Funds collected by tax payers  
d) Funds by private sectors
10. If an organization needs to run a highly sensitive and mission critical application with unpredictable performance and capacity requirements. Which of the following models would best meet its requirements.  
a) Private cloud  
b) Public cloud  
c) On-premise data centers  
d) Hybrid cloud
11. Read the following statement given below and choose the correct alternative:  
Statement 1 – The India system of medicine is known as AYUSH  
Statement 2 – Indian system of medicine is highly expensive.  
a) Both are correct  
b) Both are incorrect  
c) Statement 1 is correct and Statement 2 is incorrect  
d) Statement 1 is incorrect and Statement 2 is correct
12. Which of the following risk does not exist during the construction phase?  
a) Political risk  
b) Site risk  
c) Financing risk  
d) Demand risk
13. Which statement about project financing is incorrect?  
a) Creditors typically have limited (or) no recourse to project sponsors.  
b) Risks are assessed and evaluated across the sponsor portfolio of the assets.  
c) Highly structured and time consuming financing arrangements  
d) Project cash flows are segregated from the sponsoring entity.
14. In India, AMC must be registered with-  
a) Companies Act, 2013  
b) No registration required  
c) Securities Exchange Board of India  
d) Reserve Bank of India
15. Equity related schemes are \_\_\_\_\_ risky when compared to debt schemes.  
a) Less  
b) Equally  
c) More  
d) Cannot say
16. Some more specific reasons for conducting performance testing include.  
a) Assessing release readiness  
b) Assessing infrastructure adequacy  
c) Assessing adequacy of developed software performance  
d) All of above
17. In business, there are several types of business organization, what are these?  
a) Private  
b) Public and Voluntary  
c) Voluntary and private  
d) Public, private and voluntary

18. \_\_\_\_\_ is also called zero coupon bond.  
a) Trade bills      b) Call money      c) Treasury bills      d) Commercial papers
19. SEBI announced plans to tighten regulations for which type of trading?  
a) Spot trading      b) Investor trading  
c) Algorithmic trading      d) None of these
20. A bond which has a provision that allows the holder of the bond the right to force the issuer to payback the principal on the bond is called as \_\_\_\_\_.  
a) Callable bond      b) Put bond      c) Floating rate bonds      d) Fixed rate bonds
21. The capital market in India is controlled by,  
a) RBI      b) NABART      c) SEBI      d) IRDA
22. Nifty was established in which year?  
a) 1952      b) 1965      c) 1996      d) None of these
23. The money market where debt and stocks are traded and maturity period is more than higher is known as,  
a) Long term market      b) Counter market  
c) Capital market      d) Shorter-term market
24. The regulatory body for the securities market in India is,  
a) Stock exchanges      b) IRDA  
c) RBI      d) SEBI
25. What is the role of the securities and board exchange of India?  
a) To promote individual business  
b) Facilitating credit flow for promotion and development of agriculture, Cottage and village industries  
c) The custodian of the foreign reserve, controller of credit and managing printing and supply of currency notes in the country  
d) Protect the interests of investors in securities
26. In which market debt and stocks are traded and maturity period is more than a year?  
a) Money market      b) Share market  
c) Short term market      d) Capital market
27. What is short term market?  
a) Market in which securities are bought and sold.  
b) Strategies in the stock market or futures market in which the time duration between entry and exit is within a range of a few days to a few weeks.  
c) Market in which participants trade directly between two parties.  
d) An investment that is found on the assets side of a company's balance sheet.
28. What is Export credit Guarantee corporation?  
a) A range of insurance covers Indian exporters against the risk of non-realization of export proceeds due to commercial or political risks.  
b) An export finance-based institution exchanged in integrating foreign trade and investments with the national economic growth  
c) A financial market in which long term debt or equity-backed securities are bought and sold.  
d) None of above

29. What is primary market?
- The amount the seller receives following the sale of an asset after all costs and expenses are deducted.
  - The value of the assets of the company or the value of the assets being disposed of determined without regard to any liabilities associated with such assets.
  - Where investors buy unsell securities they already own.
  - Market in which new securities are issued by the corporation to raise funds.
30. Which security holders will get unfulfilled obligations of the non-installments of profits by the company during the misfortune?
- Convertible preference share holder.
  - Ordinary equity holders.
  - Corporate bonds
  - Cumulative preference share holders.
31. In the primary market the initial time given offers to be public, in financial exchange is considered as?
- Initial public offering
  - Trade
  - Share
  - Insurance offering
32. The bonds that are supported with income from the project are offered to back specific venture is classified as?
- Finance bonds
  - Revenue bonds
  - Trade
  - Convertible bonds
33. Which from the following represents the correct project cycle?
- A planning → Initiating → Executing → Closing
  - Planning → Executing → Initiating → Closing
  - Initiating → Planning → Executing → Closing
  - Initiating → Executing → Planning → Closing
34. Which of the following is not correct about initial phase of a project?
- The cost associated at the beginning of the project is highest.
  - Stake holders have maximum influence during this phase
  - The highest uncertainty is at this stage of the project.
  - All the above statements are correct.
35. Risk must be considered in the phase and weighed against the potential benefit of the project's success in order to decide if the project should be chosen. Select one :
- Completion
  - Execution
  - Planning
  - Initiation
36. Resource requirement in project becomes constant while the project is in its \_\_\_\_\_ progress stage.
- 40 to 55%
  - 55 to 70%
  - 70 to 80%
  - 80 to 95%
37. Which of the following statements is true?
- PERT is considered as a deterministic approach and CPM is a probabilistic technique.
  - PERT is considered as a probabilistic techniques and CPM is considered as a deterministic approach.
  - PERT and CPM are both probabilistic techniques.
  - PERT and CPM are both considered as deterministic approaches.

38. Which of the following is a factor that influences project selection?  
a) Perceived and real needs                      b) List of potential and ongoing projects  
c) Current organizational environment              d) All of the above
39. When classifying and ranking projects, which of the following refers to the amount and type of resources the project requires and their availability?  
a) Value chain availability                      b) Business placement  
c) Resource availability                      d) Potential benefits
40. During feasibility analysis it is necessary to examine several alternative solutions because,  
i) a comparison of alternatives will lead to a cost-effective solution.  
ii) a pre-conceived single solution may turn out to be unimplementable.  
iii) It is always good to examine alternatives.  
iv) Management normally looks at alternatives.  
a) (i) and (iii)      b) (i) and (iv)              c) (i) and (ii)              d) (ii) and (iv)
41. One of the largest infrastructure NBFC defaulted on loan payments. This led to loss of investor confidence in NBFCs as a whole and especially those with infrastructure lending as a focus. Creating a liquidity crunch and ultimately increasing the cost of funds for most NBFCs. Which year it was  
a) 2019                      b) 2020                      c) 2018                      d) 2015
42. ESG parameters stand for,  
a) Environment, Social and Corporate Governance  
b) Environment social governments  
c) Estimation societal grants  
d) None of the above
43. What do you mean by leasing contract model?  
a) Leasing is in the control of banks.  
b) The infrastructure asset owned by a public entity is leased out to a private partner.  
c) Done as one to one basis.  
d) Leasing model is for short period
44. Why do government uses HAM?  
a) Hybrid annuity model is profitable.  
b) HAM is mix of BOT and EPC models which can be used installed projects  
c) It is complicated to resolve long term pending payments  
d) Revenue is more and direct access to government
45. Infrastructure Investment Trust (Inv IT) are a key way in,  
a) Public limited companies and their investments.  
b) To monetizing any investments.  
c) Private developers can monetize their investments  
d) Because InvIT is very mature in India
46. In Infrastructure stages of development which stage has more risk.  
a) Green field (early stage)                      b) Green field (later stage)  
c) Brown field                      d) All of these

47. Debt and capital are used for,  
a) Business operations  
b) Capital expenditure  
c) Acquisitions  
d) All of the above
48. Methods of recapitalization include,  
i) Issue debt and repurchase equity  
ii) Issue debt and pay a large dividend to equity investors.  
iii) Issue equity and repay debt.  
a) (i) and (ii)      b) (i) and (iii)      c) (i), (ii) and (iii)      d) (ii) and (iii)
49. In a Leveraged Buy Out (LBO) transactions, a firm will take as significant leverage to,  
a) Finance the acquisition  
b) Restrict the acquisition  
c) Decrease equity returns  
d) To discourage borrowing of funds
50. Among the following options, which is a capital receipt?  
a) Tax received      b) Dividend received      c) Disinvestment      d) External grants

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# GBCS SCHEME

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21CV42

## Fourth Semester B.E. Degree Examination, June/July 2023 Fluid Mechanics and Hydraulics

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define the following with units:  
(i) Mass density (ii) Specific gravity  
(iii) Dynamic viscosity (iv) Surface tension (06 Marks)
- b. State and prove Pascal's law. (06 Marks)
- c. An U-tube differential manometer connects two pipes A and B. Pipe A contains  $CCl_4$  (Sp. Gr. = 1.59) under  $130 \text{ kN/m}^2$  gauge pressure. Pipe B contains oil (Sp. Gr. = 0.82) under  $200 \text{ kN/m}^2$  gauge pressure. Pipe A is 2.5 m above pipe B. The manometer contains mercury. Calculate the difference in mercury levels. Draw neat sketch. The level of mercury connected to pipe A is in level with centre of pipe B. (08 Marks)

OR

- 2 a. Derive an expression for total pressure and centre of pressure on a plane surface immersed vertically in water. (06 Marks)
- b. Calculate the specific weight, density, specific volume and specific gravity of two litres of a liquid which weighs 15 N. (06 Marks)
- c. A  $1.2 \text{ m} \times 1.8 \text{ m}$  size rectangular plate is immersed in water with an inclination of  $30^\circ$  to the horizontal. The 1.2 m side of the plate is kept horizontal at a depth of 30 m below the water surface. Compute the total pressure on the surface and the position of centre of pressure. (08 Marks)

### Module-2

- 3 a. Explain:  
(i) Steady and unsteady flow  
(ii) Rotational and irrotational flow  
(iii) Laminar and turbulent flow (06 Marks)
- b. Derive continuity equation in Cartesian coordinates for 3 dimensional flow. (08 Marks)
- c. List the assumptions made in deriving Bernoulli's equation. (06 Marks)

OR

- 4 a. State and derive the Bernoulli's equation starting from the Euler's equation of motion with a neat sketch. (06 Marks)
- b. What is venturimeter? Derive an expression for discharge through a venturimeter. (06 Marks)
- c. A horizontal venturimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the differential manometer connected to the venturimeter is 180 mm of Hg. Determine the discharge (Q) if  $C_d = 0.98$ . (08 Marks)

### Module-3

- 5 a. Explain different hydraulic coefficients and establish the relation between them. (06 Marks)
- b. Derive an expression for discharge over a triangular notch. (06 Marks)
- c. Water flows over a rectangular notch 1.2 m wide at a depth of 15 cm and afterwards passes through a triangular right angled notch. Taking coefficient of discharge for rectangular notch 0.62 and for triangular notch 0.59. Find the depth over the triangular notch. (08 Marks)

OR

- 6 a. Explain:
- (i) Major and minor losses
  - (ii) Pipes in series and parallel
  - (iii) Water hammer (06 Marks)
- b. Derive Darcy-Weisbach equation for head loss due to friction in a pipe. (06 Marks)
- c. Water is required to be supplied to a colony of 4000 residents at a rate of 180 litres per person from a source 3 km away. If half the daily requirements need to be pumped in 8 hours against a friction head of 18 m, find the size of the main pipe supplying water. Assume friction factor as 0.028. (08 Marks)

**Module-4**

- 7 a. Define open channel flow. Give the classification of flow through channels with example. (06 Marks)
- b. Define most economical channel section. Derive the conditions for best hydraulic triangular channel section. (06 Marks)
- c. A rectangular channel 6m wide and 1m depth of water has a bed slope of 1 in 900 and is having  $n = 0.012$ . Determine the discharge. What will be the dimensions of the channel for maximum discharge with amount of lining being kept constant? Also compute percentage increase in discharge. (08 Marks)

OR

- 8 a. What is specific energy curve? Draw it and derive expressions for critical depth and critical velocity for rectangular channel. (06 Marks)
- b. Derive the relationship between conjugate depths in case of hydraulic jump on a horizontal floor. (06 Marks)
- c. A rectangular channel with bottom width 4m and bed slope 0.0008 has a discharge of  $1.5 \text{ m}^3/\text{s}$ . In a GVF channel the depth at a certain section is 0.3 m. If  $n = 0.016$ , determine the type of profile. (08 Marks)

**Module-5**

- 9 a. Show that for a free jet of water striking at the centre of semicircular vane, the maximum efficiency occurs when the vane velocity is  $\frac{1}{3}$  of jet velocity and  $\eta_{\max} = 59.2\%$ . (06 Marks)
- b. With a neat sketch, explain the components of Pelton wheel. (06 Marks)
- c. Obtain an expression for the work done per second by water on the runner of a Pelton wheel. Hence derive an expression for maximum efficiency of the Pelton wheel. (08 Marks)

OR

- 10 a. By means of a neat sketch, explain the Francis Turbine. (06 Marks)
- b. Define: (i) Manometric head (ii) Static head (iii) Suction head (iv) Delivery head, for centrifugal pump. (06 Marks)
- c. The following data is given for a Francis Turbine.  
 Net head  $H = 60 \text{ m}$ , speed  $N = 700 \text{ rpm}$ , shaft power = 294.3 KW,  $\eta_0 = 84\%$ ,  $\eta_h = 93\%$ , flow ratio = 0.20; breadth ratio,  $n = 0.1$ ; outer diameter of the runner =  $2 \times$  inner diameter of runner. The thickness of vanes occupy 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine:
- (i) Guide blade angle
  - (ii) Runner vane angles at inlet and outlet
  - (iii) Diameters of runner at inlet and outlet
  - (iv) Width of wheel at inlet (08 Marks)

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# CBCS SCHEME

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21CV43

## Fourth Semester B.E. Degree Examination, June/July 2023 Public Health Engineering

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Briefly explain various type of water demand. (10 Marks)  
b. Explain the factor affecting the design period. (05 Marks)  
c. Explain the method of sampling of water. (05 Marks)

OR

- 2 a. Discuss the importance of physical, chemical and biological characteristics of water. (08 Marks)  
b. Explain Titrimetric method of determining Alkalinity of given water ample. (08 Marks)  
c. Discuss the factor effecting the rate of water demand. (04 Marks)

### Module-2

- 3 a. Draw a flow chart of conventional water treatment plant and indicate various units. (05 Marks)  
b. Design a rectangular sedimentation tank to treat 2.4 million liters of raw water per day. The detention period may be assumed to be 3 hours. (05 Marks)  
c. Briefly explain theory of filtration. (05 Marks)  
d. Explain the limitation of aeration process. (05 Marks)

OR

- 4 a. Design six sand filter beds from the following data :  
Population to be served = 50,000  
Persons per capita demand = 150 liters/head/day  
Rate of filtration = 180 liters/hr/SQ.M  
Length of each Bed = twice the breadth.  
Assume Max. Demand as 1.8 times the average daily demand. Also assume that one unit, out of six, will be kept as stand by. (08 Marks)  
b. Briefly explain, how you will determine the optimum coagulant quantity by jar test. (08 Marks)  
c. Briefly explain theory of sedimentation. (04 Marks)

### Module-3

- 5 a. With the help of chemical formula explain Zeolite process of removing hardness. (05 Marks)  
b. Explain break point chlorination. (05 Marks)  
c. Briefly explain types of sewerage system. (05 Marks)  
d. The 5 day 30°C BOD of sewage sample is 110MG/L. Calculate its 5 days 20°C BOD. Assume the deoxygenation constant at 20°C,  $K_{20}$  AS 0.1. (05 Marks)

OR

- 6 a. Explain theory of chlorination of water with chemical equation. (05 Marks)  
 b. With the help of chemical formula explain Lime-SODA process of removing hardness. (05 Marks)  
 c. A city discharges 1500 liters per second of sewage into a stream whose minimum rate of flow is 6000 liters per second. The temperature of sewage as well as water is 20°C. The 5 day BOD AT 20°C for sewage is 200MG/L and that of river water is 1MG/L. The D.O. content of sewage is 2 ERO and that of stream is 90% of the saturation D.O. If the minimum D.O. to be maintained in the stream is 4.5MG/L. Find out the degree of sewage treatment required. Assume the de-oxygenation coefficient as 0.1 and de-oxygenation coefficients as 0.3. [Assume saturation D.O AT 20°C is 9.17 mg/ℓ]. (10 Marks)

**Module-4**

- 7 a. With neat flow diagram, explain unit operation and process of municipal waste water treatment. (06 Marks)  
 b. Discuss briefly with neat sketch grit chamber and oil and grease removal tank. (08 Marks)  
 c. With a neat diagram, explain activated sludge process. (06 Marks)

OR

- 8 a. With a neat sketch explain the working of Manhole and CATCH basin. (10 Marks)  
 b. Explain the importance of screens and types of screens in the sewage treatment process. (10 Marks)

**Module-5**

- 9 a. With a neat sketch explain construction and operation of trickling filters. (08 Marks)  
 b. With a neat sketch explain oxidation pond. (07 Marks)  
 c. Briefly explain stages in the sludge digestion process. (05 Marks)

OR

- 10 a. Design suitable dimensions of a circular trickling filter units for treating 5 million liters of sewage per day. The BOD of the sewage is 150 MG/L. (08 Marks)  
 b. Briefly explain factors affecting sludge digestion and their control. (08 Marks)  
 c. Explain the advantages of two stage digestion. (04 Marks)

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21CV44

## Fourth Semester B.E. Degree Examination, June/July 2023 Analysis of Structures

Time: 3 hrs.

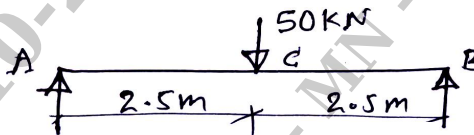
Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

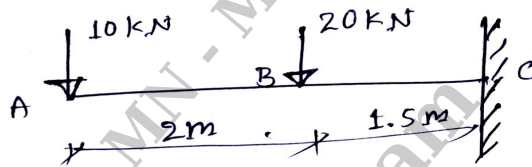
- 1 a. Determine maximum slope and maximum deflection for simply supported beam as shown in the Fig. Q1(a). Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $I = 15 \times 10^6 \text{ mm}^4$ . Use Moment Area method. (10 Marks)

Fig. Q1(a)



- b. For the beam loaded as shown in Fig. 1(b). Determine the slope and deflection at the free end. Use Conjugate beam method. (10 Marks)

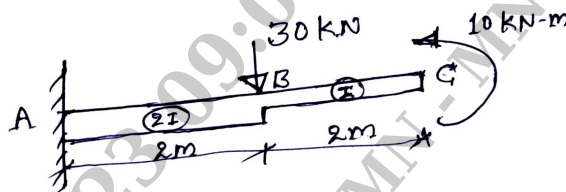
Fig. Q1(b)



OR

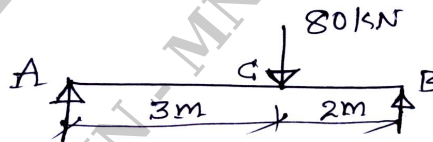
- 2 a. Calculate slope and deflection at free end for the cantilever beam as shown in Fig. Q2(a). Use moment area method. (10 Marks)

Fig. Q2(a)



- b. For the beam loaded as shown in the Fig. Q2(b), determine the maximum slope and deflection under point load. Use Conjugate beam method. (10 Marks)

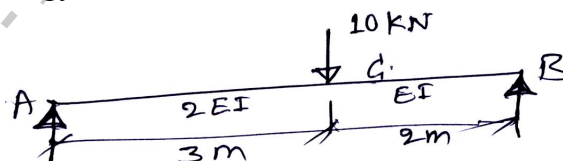
Fig. Q2(b)



### Module-2

- 3 a. Derive an expression for strain energy due to bending. (08 Marks)  
 b. Determine the deflection for a simply supported beam as shown in Fig. Q3(b). Under point load by using Strain energy method.  $E = 200 \times 10^6 \text{ kN/m}^2$  &  $I = 25 \times 10^6 \text{ m}^4$ . (12 Marks)

Fig. Q3(b)

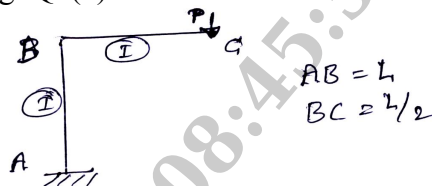


Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 4 a. Derive an expression for strain energy due to shear force. (08 Marks)  
 b. Using Cartigliano's theorem, determine the vertical and horizontal deflection at the free end of the frame as shown in Fig. Q4(b). (12 Marks)

Fig. Q4(b)

**Module-3**

- 5 a. A three hinged parabolic arch of span 20m and a central rise of 5m carry a point load of 200 kN at 6m from the left support. Find the support reactions at A and B. Calculate normal thrust and radial shear at 6m from the left support. Also draw the BMD. (12 Marks)  
 b. A suspension cable having a support at same level of span 30m and maximum dip of the cable is 3m subjected to UDL of 10kN/m over the entire length. Find the support reactions at 'A' & 'B'. Also find maximum tensile force in the cable and length of the cable. (08 Marks)

OR

- 6 a. A 3 hinged parabolic arch of span 60m and a central rise of 15m carry two point loads of 200kN at 15m from the left support and 300kN at 15m from the right support. Find the support reactions at A and B. Calculate normal thrust and radial shown at 20m from the left support. Also draw the BMD. (12 Marks)  
 b. Derive an expression to find length of a cable subjected to UDL throughout with usual notations. (08 Marks)

**Module-4**

- 7 Analyse a continuous beam ABCD consists of 3 spans and it is loaded as shown in the Fig. Q7 by slope deflection method. Determine the moments at supports and draw the SFD & BMD. Also draw the deflected shape of the structure. (20 Marks)

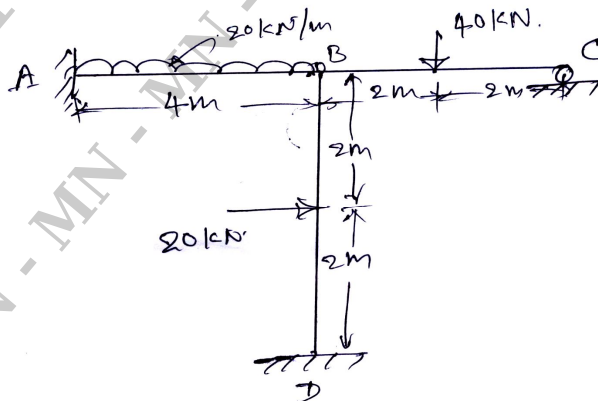
Fig. Q7



OR

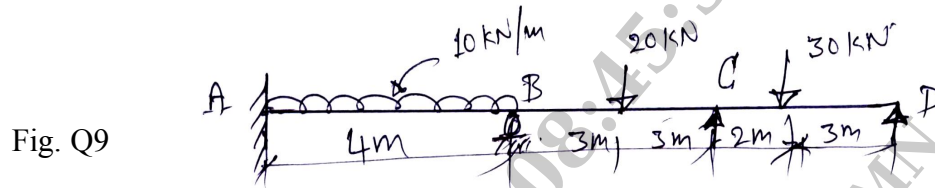
- 8 Analyse the given frame as shown in Fig. Q8 by slope deflection method. EI is constant for all the members. Draw BMD and sketch the deflected shape of the frame. (20 Marks)

Fig. Q8

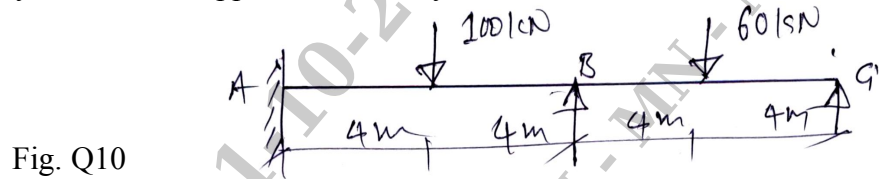


**Module-5**

- 9 Analyse the given continuous beam shown in Fig. Q9 by Stiffness method and sketch BMD & SFD. (20 Marks)

**OR**

- 10 Analyse the given continuous beam shown in Fig. Q10 by Stiffness method. The support 'B' sink by  $300/EI$  and support 'C' sinks by  $200/EI$ . Sketch BMD and SFD. (20 Marks)



\* \* \* \* \*

# CBCS SCHEME

21CV485

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Question Paper Version : A

Fourth Semester B.E. Degree Examination, June/July 2023

## Green Buildings

Time: 1 hr.]

[Max. Marks: 50

### INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

- 
1. Which of the following is not the purpose of a Green Building?  
a) To reduce use of water  
b) To minimize damage of the environment  
c) Re use of waste materials  
d) None of these
  2. Sustainable planning considered environmental, social and \_\_\_\_\_ impacts of a Buildings.  
a) Technological  
b) Economical  
c) Both a and b  
d) None of these
  3. Laterites are rich in  
a) Iron and Aluminium  
b) Silica  
c) Fluorides  
d) Magnesium
  4. Which order is correct in the manufacturing of Mud Bricks?  
a) Preparation, Moulding, Drying, Curing  
b) Preparation, Moulding, Drying, Burning  
c) Drying, Moulding, Preparation, Curing  
d) Drying, Preparation, Moulding, Cutting
  5. Concrete is a combination of  
a) Fine aggregate + Course aggregate + Cement + Water  
b) Course aggregate + Soil + Water  
c) Cement + Water  
d) Cement + Fine aggregate + Water
  6. \_\_\_\_\_ are the Artificial Pazzolanos.  
a) Flyash, pumicite  
b) Silica fumes  
c) Flyash, GGBS  
d) None of these
  7. Gypsum is used to  
a) Bricks  
b) Electric Boards  
c) None of these  
d) Plaster of Paris

8. The composite material consisting of mixtures of cement mortar or concrete and discontinuous, discrete, uniformly dispersed suitable fibre is called.
- a) Ferro cement concrete                      b) Fibre reinforced concrete  
c) Special concrete                                d) Normal concrete
9. Which of the following is known as "Poor Man's Timber".
- a) Rubber                      b) Teak                      c) Rorewood                      d) Bamboo
10. The best practice of disposal of Construction and Demolition (C and D) debris is
- a) Incineration                      b) Recycling                      c) Land fills                      d) Solidification
11. \_\_\_\_\_ Bond is considered as the strongest bond in Brick wall
- a) English                      b) Flemish                      c) Raking                      d) Dutch
12. The \_\_\_\_\_ Bond is possible to reduce the 25% of cost of bricks.
- a) English                      b) Header                      c) Flemish                      d) Rat trap
13. \_\_\_\_\_ is the type of wall which consists of two separate walls with a gap in between them.
- a) Partition wall                                      b) Cavity wall  
c) Party wall    d) Separating wall
14. In the construction of \_\_\_\_\_ elements, partial or complete elimination of form work is achieved.
- a) Ferro cement                      b) Wall                      c) Beams                      d) Columns
15. The two separate walls in a cavity wall are called as
- a) Petals                      b) Blocks                      c) Leaves                      d) Fragments
16. PSC stands for
- a) Pre stressed concrete                      b) Post stressed cement  
c) Polymer special concrete                      d) None of these
17. By using filler slab technique
- a) Aesthetic ceiling is not good                      b) 20% saving of concrete is there  
c) Loads on foundation increases                      d) All of these
18. The head office of COSTFORD is situated in
- a) Pune                      b) Bangalore                      c) Delhi                      d) Thrissur
19. Which are the agency contribute for the cost effective building technologies?
- a) TATA                      b) HABITAT                      c) L and T                      d) All of these
20. A good brick should contain about \_\_\_\_\_ of silica
- a) 5% - 7%                      b) 50% - 60%                      c) < 10%                      d) 15% - 20%
21. The process of taking out stones from natural rock is known as
- a) Weathering                      b) Quarrying                      c) Dressing                      d) Cladding
22. The solidification of molten magma when it reaches the surface of earth results in the formation of.
- a) Sedimentary rocks                                      b) Metamorphic rocks  
c) Igneous rocks    d) None of these

23. Which of the following activities has contributed maximum to global warming?  
 a) Industrial processes  
 b) Deforestation  
 c) Agriculture  
 d) Fossil fuel consumption
24. Which of the following gases has maximum global warming potential?  
 a) Chlorofluorocarbons  
 b) Carbon di-oxide  
 c) Sulphur hexafluoride  
 d) Methane
25. Which of the following country is the largest emitter of carbon di oxide?  
 a) USA  
 b) Chine  
 c) India  
 d) Saudi Arabia
26. The concept of the carbon foot print was developed by  
 a) UNFCC  
 b) UNEP  
 c) William E, Rees and Mathis Wackernagel  
 d) Ernst Haeckel
27. The total set of carbon emissions caused by an individual/company/business is called  
 a) Carbon hand print  
 b) Carbon foot print  
 c) Carbon summary  
 d) Carbon sink
28. Which energy efficiency measures are in the buildings envelope?  
 a) Orientation and Passive design  
 b) Outside walls, Windows, doors and roof etc.  
 c) HVAC, LED's, TV  
 d) Bricks and stones
29. What is a helpful label for the comparison of different electricity using appliances?  
 a) Shooting STAR  
 b) Saving STAR  
 c) STAR label  
 d) STAR fish
30. \_\_\_\_\_ is building with zero net energy consumption.  
 a) Zero energy building  
 b) Natural energy buildings  
 c) Conventional energy building  
 d) None of these.
31. A Building is a structure that environmentally responsible and resource efficient throughout its life cycle is called as  
 a) Zero Energy Building  
 b) Green Building  
 c) Mass housing  
 d) Pre cost housing
32. The building which are engineered at a factory and assembled at site are termed as  
 a) Pre-Engineered Building  
 b) Conventional Building  
 c) Precost Building  
 d) Pre-fabricated Building
33. When number of houses is constructed to suit the requirement of population of an area or country, then it is termed as  
 a) Green Building  
 b) Precast Building  
 c) Mass Housing  
 d) All of these
34. A zero building produces \_\_\_\_\_ energy to meet its own annual energy consumption requirement.  
 a) Solar  
 b) Renewable  
 c) Non renewable  
 d) Zero
35. Where is India first green building located?  
 a) ITC Green center, Gurgaon  
 b) Suzlon earth, Pune  
 c) Wipro Technologies, Gurgaon  
 d) Sohrabji Green Business centre, Hydrabad



36. Which of the following green rating systems are currently working in India?  
 a) LEED                      b) GRIHA                      c) Both a and b                      d) None of these
37. LEED means  
 a) Leadership in Energy and Efficiency Design  
 b) Leadership in Energy and Efficiency Document  
 c) Leadership in Energy and Environmental Design  
 d) Leadership in Energy and Environmental Document
38. LEED gives rating in form  
 a) 1 star, 2 star, 3 star                      b) Platinum, Gold, Silver  
 c) A, B and C                      d) Both a and b
39. When GRIHA was launched in India?  
 a) 2008                      b) 2006                      c) 2010                      d) 2011
40. What is the full form of IGBC?  
 a) Indian Green Building Council                      b) Indian Green Building Control  
 c) International Green Building Council                      d) None of these
41. How many set of criteria formulated by GRIHA for rating the building?  
 a) 33                      b) 34                      c) 31                      d) 32
42. Which of the below is a global scale environmental issue?  
 a) Eutrophication                      b) Regional Ozone                      c) Climate change                      d) Pollution
43. Carbon footprint can be measured by  
 a) Carbon dating                      b) Instruments                      c) Carbon accounting                      d) Formula
44. \_\_\_\_\_ is the conventional source for hydel power  
 a) Tidal wave                      b) Currents                      c) Water                      d) Ripples
45. Which of the following is not used in a passive solar heating/cooling system in building?  
 a) Building walls                      b) Building roofs  
 c) Building floors                      d) Air conditioners
46. Which of the following is an example of Passive solar technology?  
 a) Photovoltaic                      b) Solar furnace  
 c) Active solar water heating system                      d) All of these
47. Which part of a house receives majority of solar radiation?  
 a) Roofs                      b) Side walls                      c) Floors                      d) Door
48. A Building with excessive glass cover  
 a) Results in Freezing                      b) Result in a pleasant temperature  
 c) Damages the Building material                      d) Results in Overheating
49. In Sandwich composites, which of the following material can be used for filling purpose?  
 a) Wood                      b) Cement                      c) Polymer                      d) All of these
50. Which is the least preferred strategy of integrated solid waste management according to their Environmental benefits?  
 a) Land fills                      b) Composting                      c) Recycling                      d) Waste to Energy

\* \* \* \* \*

# CBCS SCHEME

21CV485

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Question Paper Version : B

**Fourth Semester B.E. Degree Examination, June/July 2023**

## **Green Buildings**

Time: 1 hr.]

[Max. Marks: 50

### **INSTRUCTIONS TO THE CANDIDATES**

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- a) UNFCC                      b) UNEP  
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c) HVAC, LED’s, TV  
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- a) Shooting STAR                      b) Saving STAR  
c) STAR label                      d) STAR fish
50. \_\_\_\_\_ is building with zero net energy consumption.
- a) Zero energy building                      b) Natural energy buildings  
c) Conventional energy building                      d) None of these.

\* \* \* \* \*

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Question Paper Version : C

**Fourth Semester B.E. Degree Examination, June/July 2023**  
**Green Buildings**

Time: 1 hr.]

[Max. Marks: 50

**INSTRUCTIONS TO THE CANDIDATES**

1. Answer all the **fifty** questions, each question carries one mark.
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3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
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- 
1. A Building is a structure that environmentally responsible and resource efficient throughout its life cycle is called as
    - a) Zero Energy Building
    - b) Green Building
    - c) Mass housing
    - d) Pre cost housing
  2. The building which are engineered at a factory and assembled at site are termed as
    - a) Pre-Engineered Building
    - b) Conventional Building
    - c) Precost Building
    - d) Pre-fabricated Building
  3. When number of houses is constructed to suit the requirement of population of an area or country, then it is termed as
    - a) Green Building
    - b) Precast Building
    - c) Mass Housing
    - d) All of these
  4. A zero building produces \_\_\_\_\_ energy to meet its own annual energy consumption requirement.
    - a) Solar
    - b) Renewable
    - c) Non renewable
    - d) Zero
  5. Where is India first green building located?
    - a) ITC Green center, Gurgaon
    - b) Suzlon earth, Pune
    - c) Wipro Technologies, Gurgaon
    - d) Sohrabji Green Business centre, Hydrabad
  6. Which of the following green rating systems are currently working in India?
    - a) LEED
    - b) GRIHA
    - c) Both a and b
    - d) None of these
  7. LEED means
    - a) Leadership in Energy and Efficiency Design
    - b) Leadership in Energy and Efficiency Document
    - c) Leadership in Energy and Environmental Design
    - d) Leadership in Energy and Environmental Document

8. LEED gives rating in form  
 a) 1 star, 2 star, 3 star  
 c) A, B and C  
 b) Platinum, Gold, Silver  
 d) Both a and b
9. When GRIHA was launched in India?  
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 b) 2006  
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 a) Incineration  
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 c) Land fills  
 d) Solidification
21. How many set of criteria formulated by GRIHA for rating the building?  
 a) 33  
 b) 34  
 c) 31  
 d) 32

22. Which of the below is a global scale environmental issue?  
a) Eutrophication    b) Regional Ozone    c) Climate change    d) Pollution
23. Carbon footprint can be measured by  
a) Carbon dating    b) Instruments    c) Carbon accounting    d) Formula
24. \_\_\_\_\_ is the conventional source for hydel power  
a) Tidal wave    b) Currents    c) Water    d) Ripples
25. Which of the following is not used in a passive solar heating/cooling system in building?  
a) Building walls    b) Building roofs  
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26. Which of the following is an example of Passive solar technology?  
a) Photovoltaic    b) Solar furnace  
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27. Which part of a house receives majority of solar radiation?  
a) Roofs    b) Side walls    c) Floors    d) Door
28. A Building with excessive glass cover  
a) Results in Freezing    b) Result in a pleasant temperature  
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29. In Sandwich composites, which of the following material can be used for filling purpose?  
a) Wood    b) Cement    c) Polymer    d) All of these
30. Which is the least preferred strategy of integrated solid waste management according to their Environmental benefits?  
a) Land fills    b) Composting    c) Recycling    d) Waste to Energy
31. The process of taking out stones from natural rock is known as  
a) Weathering    b) Quarrying    c) Dressing    d) Cladding
32. The solidification of molten magma when it reaches the surface of earth results in the formation of.  
a) Sedimentary rocks    b) Metamorphic rocks  
c) Igneous rocks    d) None of these
33. Which of the following activities has contributed maximum to global warming?  
a) Industrial processes    b) Deforestation  
c) Agriculture    d) Fossil fuel consumption
34. Which of the following gases has maximum global warming potential?  
a) Chlorofluorocarbons    b) Carbon di-oxide  
c) Sulphur hexafluoride    d) Methane
35. Which of the following country is the largest emitter of carbon di oxide?  
a) USA    b) Chine    c) India    d) Saudi Arabia
36. The concept of the carbon foot print was developed by  
a) UNFCC    b) UNEP  
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37. The total set of carbon emissions caused by an individual/company/business is called  
 a) Carbon hand print    b) Carbon foot print  
 c) Carbon summary     d) Carbon sink
38. Which energy efficiency measures are in the buildings envelope?  
 a) Orientation and Passive design  
 b) Outside walls, Windows, doors and roof etc.  
 c) HVAC, LED's, TV  
 d) Bricks and stones
39. What is a helpful label for the comparison of different electricity using appliances?  
 a) Shooting STAR     b) Saving STAR  
 c) STAR label     d) STAR fish
40. \_\_\_\_\_ is building with zero net energy consumption.  
 a) Zero energy building     b) Natural energy buildings  
 c) Conventional energy building                                         d) None of these.
41. \_\_\_\_\_ Bond is considered as the strongest bond in Brick wall  
 a) English     b) Flemish     c) Raking     d) Dutch
42. The \_\_\_\_\_ Bond is possible to reduce the 25% of cost of bricks.  
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43. \_\_\_\_\_ is the type of wall which consists of two separate walls with a gap in between them.  
 a) Partition wall     b) Cavity wall  
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 a) Pre stressed concrete     b) Post stressed cement  
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 a) Aesthetic ceiling is not good     b) 20% saving of concrete is there  
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49. Which are the agency contribute for the cost effective building technologies?  
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Question Paper Version : D

**Fourth Semester B.E. Degree Examination, June/July 2023**  
**Green Buildings**

Time: 1 hr.]

[Max. Marks: 50

### INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

- 
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21. A Building is a structure that environmentally responsible and resource efficient throughout its life cycle is called as  
 a) Zero Energy Building    b) Green Building  
 c) Mass housing    d) Pre cost housing
22. The building which are engineered at a factory and assembled at site are termed as  
 a) Pre-Engineered Building    b) Conventional Building  
 c) Precast Building    d) Pre-fabricated Building
23. When number of houses is constructed to suit the requirement of population of an area or country, then it is termed as  
 a) Green Building    b) Precast Building  
 c) Mass Housing    d) All of these

24. A zero building produces \_\_\_\_\_ energy to meet its own annual energy consumption requirement.  
a) Solar                      b) Renewable                      c) Non renewable                      d) Zero
25. Where is India first green building located?  
a) ITC Green center, Gurgaon                      b) Suzlon earth, Pune  
c) Wipro Technologies, Gurgaon                      d) Sohrabji Green Business centre, Hydrabad
26. Which of the following green rating systems are currently working in India?  
a) LEED                      b) GRIHA                      c) Both a and b                      d) None of these
27. LEED means  
a) Leadership in Energy and Efficiency Design  
b) Leadership in Energy and Efficiency Document  
c) Leadership in Energy and Environmental Design  
d) Leadership in Energy and Environmental Document
28. LEED gives rating in form  
a) 1 star, 2 star, 3 star                      b) Platinum, Gold, Silver  
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