



**MAHARAJA INSTITUTE OF TECHNOLOGY
THANDAVAPURA**

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VTU Question Papers

BE - CV

III to VIII Semester

Jul/Aug -2022

2018 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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18CIV14/24

First/Second Semester B.E. Degree Examination, July/August 2022 Elements of Civil Engineering and Mechanics

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.

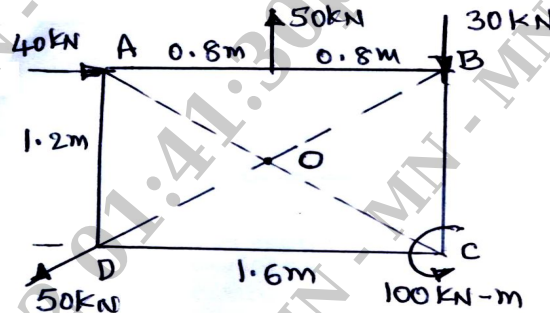
Module-1

- 1 a. Explain the role of Civil Engineering in the infrastructure development of the Country. (08 Marks)
- b. State the scope of Civil Engineering in : i) Structural Engineering ii) Geotechnical Engineering iii) Transportation Engineering. (06 Marks)
- c. State and explain Basic Idealization of Mechanics. (06 Marks)

OR

- 2 a. State and explain the effect of Infrastructural facilities on Social – Economic development of a Country. (08 Marks)
- b. State and explain Parallelogram Law of Forces. (04 Marks)
- c. Determine the Resultant force and Position of Resultant force with respect to Point 'O' of the plate shown in Fig. Q2(c) for the system of forces. (08 Marks)

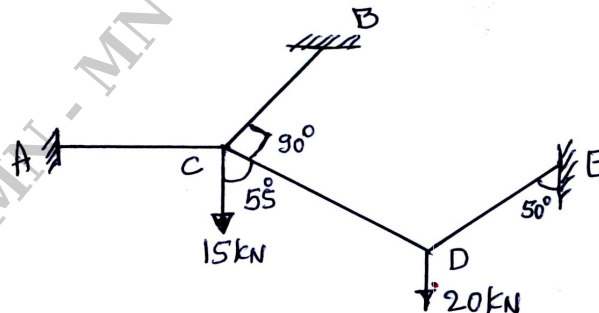
Fig. Q 2(c)



Module-2

- 3 a. State and explain Lami's theorem. (04 Marks)
- b. State the Laws of Dry Friction. (04 Marks)
- c. Find tension in string if the system is in Equilibrium shown in Fig. Q3(c). (12 Marks)

Fig. Q 3(c)



OR

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.

- 4 a. Define i) Coefficient of friction ii) Angle of friction. (04 Marks)
 b. Find Contact Pressure at surfaces of contact for the system shown in Fig. Q4(b) for two identical cylinders. (06 Marks)

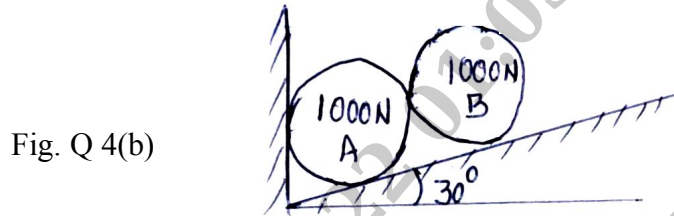


Fig. Q 4(b)

- c. Two Blocks A and B are connected by a horizontal rod and are supported on two rough planes as shown in Fig. Q4(c). The coefficient of friction of block A is 0.25 and for block B is 0.35. Find smallest weight of block A for which equilibrium can exit. If the weight of block B is 1500N. (10 Marks)

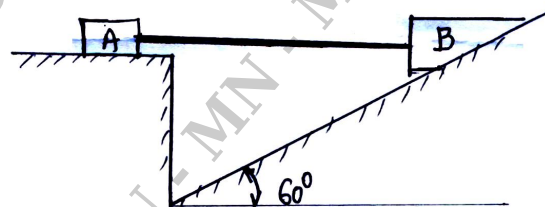


Fig. Q 4(c)

Module-3

- 5 a. State and explain different types of loads with neat sketches. (06 Marks)
 b. State the assumptions made in truss analysis. (04 Marks)
 c. Determine the support reactions of the overhanging beam shown in Fig. Q5(c). (10 Marks)

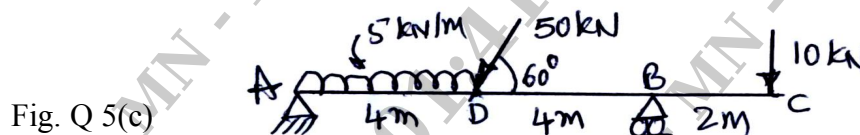


Fig. Q 5(c)

OR

- 6 a. Distinguish between Statically determinate and Indeterminate beams with examples. (06 Marks)
 b. State and explain different types of supports with neat sketches. (06 Marks)
 c. Determine the forces in members of the truss shown in Fig. Q6(c) by using method of Joints. (08 Marks)

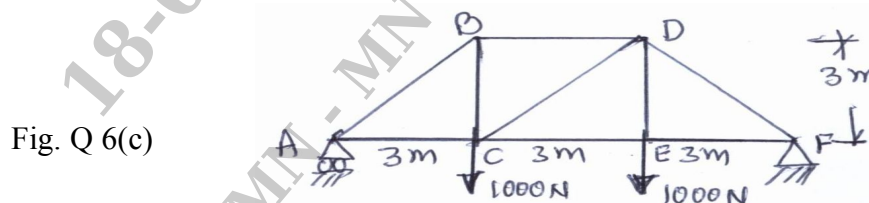


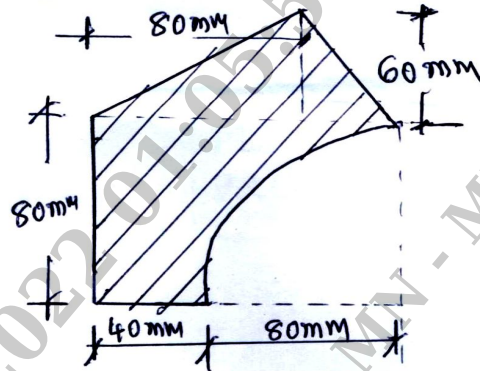
Fig. Q 6(c)

Module-4

- 7 a. Define Moment of Inertia , Centroid , Centre of Gravity , Radius of Gyration and Polar Moment of Inertia. (05 Marks)
 b. State and Prove Parallel Axis theorem. (05 Marks)

- c. Determine the Centroid of shaded area shown in Fig. Q7(c), with respect to 'O'. (10 Marks)

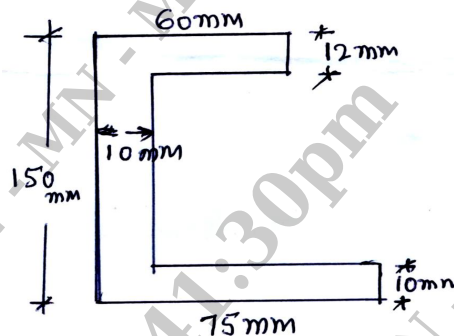
Fig. Q 7(c)



OR

- 8 a. Determine the Centroid of Semicircle about Horizontal diametrical axis. (05 Marks)
 b. Determine the Moment of Inertia of Triangle about axis passing through Base. (05 Marks)
 c. Find Radius of Gyration of the area shown in Fig. Q8(c) about Centroidal X - axis. (10 Marks)

Fig. Q 8(c)

Module-5

- 9 a. Define : i) Displacement ii) Velocity iii) Acceleration iv) Retardation v) Path. (05 Marks)
 b. State Newton's laws of Motion. (03 Marks)
 c. A bullet fired upwards at an angle of 30° to the horizontal from top of hill of height 80m and bullet strikes the ground which is 80m lower than the point of projection if the initial velocity of bullet is 100m/sec.
 Find i) Maximum height the bullet rise above the point of projection.
 ii) The velocity with which it strikes the ground.
 iii) Time of flight of bullet. (12 Marks)

OR

- 10 a. Define : i) Trajectory ii) Time of flight iii) Range. (03 Marks)
 b. Define Super elevation and state the importance of super elevation. (05 Marks)
 c. A body falling freely under the action of gravity passes two points 20m apart vertically in 0.4 seconds. From what height above the higher point the body starts to fall.
 Take $g = 9.8 \text{ m/sec}^2$ (12 Marks)

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CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, July/August 2022 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,
 (i) $e^{-2t}(2\cos 5t - \sin 5t)$ (ii) $\cosh^2 3t$ (06 Marks)
- b. Find the Laplace transform of the full wave rectifier $f(t) = E \sin \omega t$ $0 < t < \frac{\pi}{\omega}$ having a period $\frac{\pi}{\omega}$. (07 Marks)
- c. Find the inverse Laplace transform $\left[\frac{s^2 + 4}{s(s+4)(s-4)} \right]$. (07 Marks)

OR

- 2 a. Find the Laplace transform, $\frac{\cos at - \cos bt}{t}$. (06 Marks)
- b. Solve by using Laplace transform method $y'''(t) + 2y''(t) - y'(t) - 2y(t) = 0$, given $y(0) = y'(0) = 0$ and $y''(0) = 6$ (07 Marks)
- c. Express the function $f(t)$ in terms of unit step function and hence find its inverse LT,

$$f(t) = \begin{cases} \cos t & 0 < t \leq \pi \\ 1 & \pi < t \leq 2\pi \\ \sin t & t > 2\pi \end{cases}$$
 (07 Marks)

Module-2

- 3 a. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$, in $0 < x < 2\pi$. Hence deduce that
 $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$. (06 Marks)
- b. Show that the sine half range series for the function, $f(x) = Lx - x^2$, in $0 < x < L$ is
 $\frac{8L^2}{\pi^3} \sum_0^\infty \frac{1}{(2n+1)^3} \sin\left(\frac{2n+1}{L}\pi x\right)$. (07 Marks)
- c. Obtain the Fourier series of y up to the first harmonics for the following values :

x°	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.6	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. Expand the function $f(x) = x \sin x$, as a Fourier series in the interval $-\pi \leq x \leq \pi$. Deduce that $\frac{1}{1,3} - \frac{1}{3,5} + \frac{1}{5,7} \dots = \frac{\pi-2}{4}$ (06 Marks)
- b. Obtain the half range cosine series of $f(x) = x \sin x$ $0 \leq x \leq \pi$. (07 Marks)
- c. Obtain the constant term and the first three coefficients in the Fourier cosine series for y using the following data :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(07 Marks)

Module-3

- 5 a. Find the complex Fourier transform of the function, $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$.

Hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$. (06 Marks)

- b. If $\overline{f(z)} = \frac{2z^2 + 3z + 12}{(z-1)^4}$ find the value of u_0, u_1, u_2, u_3 (07 Marks)
- c. Solve by using z-transforms, $u_{n+2} + 5u_{n+1} + 6u_n = 2^n$; $u_1 = 0, u_0 = 0$ (07 Marks)

OR

- 6 a. Find the Fourier sine transform of e^{-ax} , $a > 0$. (06 Marks)
- b. Find the Fourier sine and cosine transform of $2e^{-3x} + 3e^{-2x}$. (07 Marks)
- c. Solve by using Z-transforms, $y_{n+2} + 2y_{n+1} + y_n = n$, with $y(0) = 0 = y$ (07 Marks)

Module-4

- 7 a. Use Taylor's series method to find $y(4.1)$ given that $\frac{dy}{dx} = \frac{1}{x^2 + y}$ and $y(4) = 4$. (06 Marks)
- b. Use Fourth order Runge-Kutta method to solve $(x+y)\frac{dy}{dx} = 1$, $y(0.4) = 1$ at $x = 0.5$. Correct to four decimal places. (07 Marks)
- c. The following table gives the solution of $5xy^1 + y^2 - 2 = 0$, find the value of y at $x = 4.5$ using Milne's Predictor and Corrector formulae, use the corrector formulae twice.

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

(07 Marks)

OR

- 8 a. Using modified Euler's method find y at $x = 0.2$ given $\frac{dy}{dx} = 3x + \frac{y}{2}$, with $y(0) = 1$ taking $h = 0.1$. (06 Marks)
- b. Using Runge-Kutta method of fourth order find $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ taking $h = 0.2$ (07 Marks)
- c. Apply Adams-Bashforth method to solve the equation $(y^2 + 1)dy - x^2 dx = 0$, at $x = 1$, given $y(0) = 1, y(0.25) = 1.0026, y(0.5) = 1.0206, y(0.75) = 1.0679$. Apply the corrector formulae twice. (07 Marks)

Module-5

- 9 a. Given $\frac{d^2y}{dx^2} - x^2 \frac{dy}{dx} - 2xy = 1$, $y(0) = 1$, $y'(0) = 0$, Evaluate $y(0.1)$ using Runge-Kutta method of order 4. (06 Marks)
- b. A necessary condition for the integral $I = \int_{x_1}^{x_2} f(x, y, y') dx$ where $y(x_1) = y_1$ and $y(x_2) = y_2$ to be extremum that $\frac{\partial f}{\partial y} - \frac{d}{dx} \left(\frac{\partial f}{\partial y'} \right) = 0$. (07 Marks)
- c. Show that the extremal of the functional $\int_0^1 y^2 \{3x(y'^2 - 1) + yy'^3\} dx$, subject to the conditions $y(0) = 0$, $y(1) = 2$, is the circle $x^2 + y^2 - 5x = 0$. (07 Marks)

OR

- 10 a. Apply Milne's method to compute $y(0.8)$. Given that $\frac{d^2y}{dx^2} = 1 - 2y \frac{dy}{dx}$ and the following table of initial values. (06 Marks)

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

- b. Find the extremal of the functional $\int_a^b (x^2 y'^2 + 2y^2 + 2xy) dx$. (07 Marks)
- c. Prove that Geodesics on a plane are straight line. (07 Marks)

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18CV32

Third Semester B.E. Degree Examination, July/August 2022 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. Explain: (i) Stress (ii) Strain (iii) Modulus of Elasticity (06 Marks)
- b. Define four elastic constraints. (08 Marks)
- c. Determine the stresses in various segments of circular bar shown in the Fig.Q1(c). Also compute the total elongation taking Young's modulus $E = 195 \text{ GPa}$.

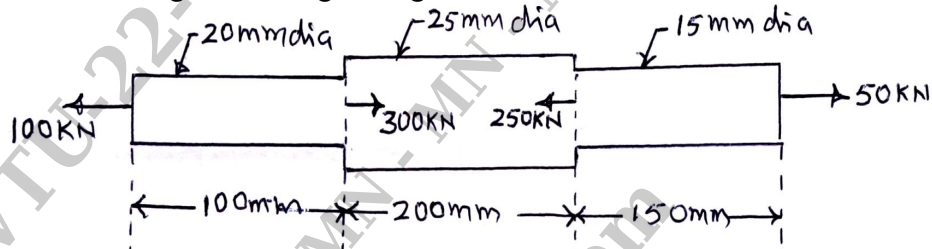


Fig.Q1(c)

(06 Marks)

OR

- 2 a. Derive an expression for the deformation of a rectangular tapering bar of uniform thickness subjected to an axial force. (10 Marks)
- b. A steel tube of 80 mm outer diameter and 10 mm thick is filled into a copper tube of 30 mm inner diameter and 10 mm thick. They are connected rigidly at the ends and subjected to an axial compression of 300 kN load. If length of bar is 600 mm, find the stresses in each material. Take $E_s = 200 \text{ GPa}$ and $E_{cu} = 120 \text{ GPa}$. (05 Marks)
- c. A steel rod of 3 cm diameter and 5 m long is connected to two grips and the rod is maintained at temperature of 95°C . Determine the stresses and pull exerted when temperature falls below 30°C if:
 - (i) The ends are not yielding
 - (ii) The ends yields by 0.12 cmTake $E = 2 \times 10^5 \text{ MN/m}^2$ and $\alpha = 12 \times 10^{-6}/^\circ\text{C}$. (05 Marks)

Module-2

- 3 a. Explain maximum shear stress theory of failure. (08 Marks)
- b. A cast iron pipe 200 mm internal diameter and 50 mm metal thickness carries water under a pressure of 5 N/mm^2 . Calculate the maximum and minimum intensities of circumferential stresses and sketch the distribution of circumferential stress intensity and intensity of radial pressure across the cross section. (12 Marks)

OR

- 4 a. Differentiate between thick and thin cylinders. (02 Marks)
- b. For thin cylinder, derive the equations for circumferential stress and longitudinal stress. (08 Marks)

- c. At a certain point in a strained material the stress conditions shown in Fig.Q4(c). Determine:
- The normal and shear stresses on the inclined plane AB.
 - Principal stresses and principal planes.
 - Maximum shear stresses and their planes.

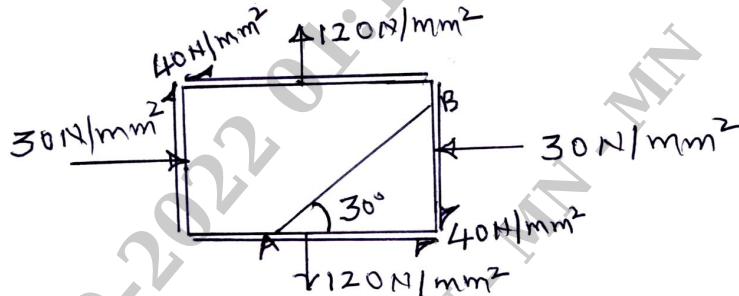


Fig.Q4(c)

(10 Marks)

Module-3

- 5 a. Explain different types of beams and supports. (06 Marks)
 b. Define: (i) Shear force (ii) Bending moment (iii) Point of contra-flexure (06 Marks)
 c. For the cantilever beam shown in Fig.Q5(c), draw shear force and bending moment diagram.

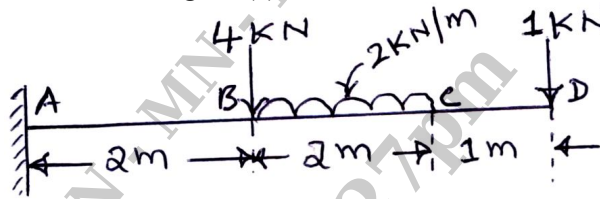


Fig.Q5(c)

(08 Marks)

OR

- 6 a. Derive the relationship between shear force, bending moment and load intensity. (08 Marks)
 b. Draw the shearforce and bending moment diagram indicating principal values for an overhanging beam shown in Fig.Q6(b). Locate point of contraflexure if any.

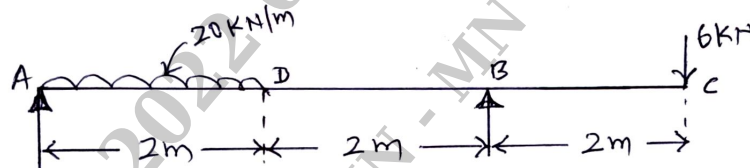


Fig.Q6(b)

(12 Marks)

Module-4

- 7 a. Derive bending equation $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notations. (10 Marks)
 b. A hollow shaft has to transmit 600 KW power at 80 rpm. Torque developed may exceed the mean torque by 40%. Design the suitable section if the working stress is 90 MPa. Take diameter ratio 0.8. What will be the angular twist measured over a length of 2 m? Take $C = 84$ GPa. (10 Marks)

OR

- 8 a. Derive torsion equation $\frac{T}{J} = \frac{C\theta}{l} = \frac{q}{R}$ for a circular shaft subjected to pure torsion. (10 Marks)
 b. Explain pure bending. (04 Marks)

- c. Draw shear stress distribution for an I-shaped section of beam shown in Fig.Q8(c). Shear force on the section is 200 kN.

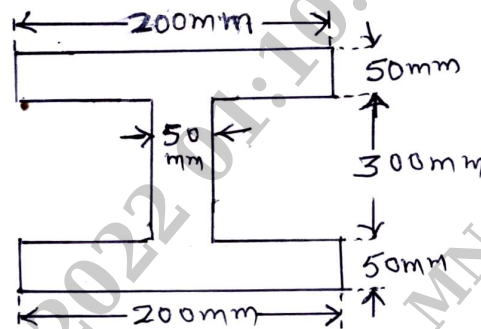


Fig.Q8(c)

(06 Marks)

Module-5

- 9 a. Derive the deflection equation for a beam in the standard form $EI \frac{d^2y}{dx^2} = -M$. (08 Marks)
- b. Define: (i) Slope (ii) Deflection (iii) Elastic curve (06 Marks)
- c. Find the Euler's crippling load for a hollow cylindrical steel column 40 mm external diameter and 4 mm thick. Consider the length of column 2.3 m and hinged at its both the ends. Also determine the crippling load by Rankines formula using constants 335 N/mm^2 and $a = \frac{1}{75000}$. Take $E = 200 \text{ kN/m}^2$. (06 Marks)

OR

- 10 a. Derive an expression for Euler's crippling load for both ends hinged column with usual notations. (08 Marks)
- b. Explain the failure of short column and long column. (04 Marks)
- c. Derive an expression for the slope and deflection for a simply supported beam carrying UDL over entire span. (08 Marks)

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18CV33

Third Semester B.E. Degree Examination, July/August 2022 Fluid Mechanics

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 Capillarity? Derive an expression for capillary rise of water in a glass tube. (06 Marks)
- b. A cube of 0.3m sides and weight 50N slides down an inclined plane sloped at 30° to the horizontal. The plane is covered by an oil of $\mu = 2.3 \text{ Pa-s}$ with 0.03mm thickness. Compute the velocity with which the cube slides down. (06 Marks)
- c. An inverted U – tube differential manometer is connected to two points of pipes A & B through which water is flowing. The vertical distance between the centres of these pipes is 30cm with B below A. Oil ($S = 0.8$) is used in manometer. The level of manometer liquid in the two limbs is 35cm above the centres of respective pipes. Determine the difference of pressure between the pipes. (08 Marks)

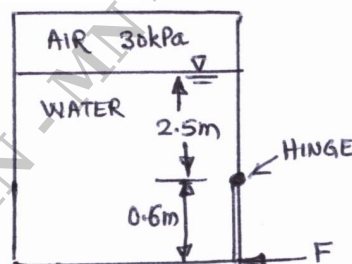
OR

- 2 a. Distinguish between : i) Ideal fluids and Real fluids (06 Marks)
ii) Manometers and Pressure gauges iii) Surface tension and Capillarity. (06 Marks)
- b. State and prove Pascal's law. (06 Marks)
- c. An oil of viscosity 5 Poise is used for lubrication between a shaft and sleeve. The diameter of shaft is 50cm and it rotates at 200 rpm. Thickness of lubrication is 1mm. Calculate the power lost in overcoming the friction for a sleeve length of 100mm. (08 Marks)

Module-2

- 3 a. Define Velocity potential function and Stream function. Hence obtain Cauchy – Riemann equation. (08 Marks)
- b. Calculate the force F required to hold the hinged door shown in Fig. Q3(b) in closed position. The door is 0.6m square. Air pressure above water surface is 30 kPa. (12 Marks)

Fig. Q3(b)



OR

- 4 a. Derive an expression for total pressure and position of center of pressure on a vertically immersed plane surface. Show that center of pressure lies below CG. (10 Marks)
- b. For the two – dimensional flow defined by $u = x - 4y$ and $v = -y - 4x$. Obtain stream function and velocity potential function. (10 Marks)

Module-3

- 5 a. Define Impulse Momentum equation and give its applications. (04 Marks)
 b. Derive an expression for discharge through a horizontal venturimeter. (08 Marks)
 c. A pipeline carrying oil of specific gravity 0.8 changes in diameter from 300mm at A to 500mm at B which is 5m above A. The rate of flow is 200 lps and pressure at A and B is respectively 20N/cm^2 and 15N/cm^2 . Determine the head loss and direction of flow. (08 Marks)

OR

- 6 a. Derive an Euler's equation of motion along a stream line and obtain Bernoulli's equation. List assumptions. (10 Marks)
 b. A horizontal pipe of 300mm diameter is bent by 135° . If 250 lps of water is flowing through the pipe with a pressure of 400kPa, compute the magnitude and direction of force exerted on the bend. (10 Marks)

Module-4

- 7 a. Derive an expression for discharge through a small orifice. (08 Marks)
 b. Differentiate between : i) Orifice and mouthpiece ii) Notch and Weir. (04 Marks)
 c. Water is flowing in a rectangular channel 1m wide and 0.75m deep water. Find the discharge over a rectangular weir of 0.6m crest length with 200mm head over crest. Take $C_d = 0.65$. Consider velocity of approach and neglect end contraction. (08 Marks)

OR

- 8 a. Explain types of nappe, with neat sketches. (06 Marks)
 b. What is Cipoletti notch? What are its advantages? Explain with expression. (08 Marks)
 c. Compute the hydraulic coefficients of an orifice of 25mm diameter discharging under a constant head of 1.5m. The coordinates of jet from vena – contracta are (2.288m, 0.915m). The discharge measured is 102 lpm. (06 Marks)

Module-5

- 9 a. Derive Darcy – Weisbach equation for friction loss through a pipe. (08 Marks)
 b. Explain pipes in series and pipes in parallel. (06 Marks)
 c. A hydraulic pipeline 3km long and 500mm diameter is used to convey water at 1.5m/s velocity. Determine the magnitude of instantaneous pressure induced if the outflow valve is closed in i) 20 sec ii) 3.5 sec. Consider the pipe as rigid and take $K_{\text{water}} = 2\text{GPa}$. (06 Marks)

OR

- 10 a. Derive an expression for an instantaneous pressure induced in a pipe due to sudden closure of valve when pipe is rigid. (06 Marks)
 b. Explain Hardy Cross method. (06 Marks)
 c. A compound pipe in series consists of 1800m long of 0.5m diameter, 1200m long of 0.4m diameter and 600m long of 0.3m diameter connected between two tanks with difference in water levels of 100m. Determine the flow rate in the pipe neglecting minor losses. Also compute the diameter of equivalent pipe to be connected between the two tanks.

Take $f = 0.04$ in $h_f = \frac{fLV^2}{ZgD}$. (08 Marks)

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CBCS SCHEME

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18CV34

Third Semester B.E. Degree Examination, July/August 2022 Building Materials and Construction

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Mention the importance of Stones, Bricks and Timber as construction materials. (05 Marks)
- b. Write a brief note on stabilized mud block. (05 Marks)
- c. List the different tests constructed on bricks. Explain any two of them. (10 Marks)

OR

- 2 a. Lists the tests conducted on fine aggregates and explain any one of them in detail. (08 Marks)
- b. What are the requirements of good building stones? (06 Marks)
- c. Explain the requirements of good bricks. (06 Marks)

Module-2

- 3 a. Briefly explain various methods of sub soil exploration. What are the factors on which the choice of a particular method depends? (10 Marks)
- b. Define Foundation. Explain different types of foundation with suitable sketches. (10 Marks)

OR

- 4 a. Write a note on classification of stone masonry. (06 Marks)
- b. Write a note on partitions walls. (04 Marks)
- c. Find dimension of a combined rectangular footing for two column A and B carrying a load of 500kN and 750kN column A 300 × 300mm, column B 400 × 400mm in size centre to centre of column is 3.4 mts SBC soil 150kN/m². Width of footing is limited to 1.8m. (10 Marks)

Module-3

- 5 a. Explain : i) Chejja ii) Canopy iii) Balcony iv) Lintel. (08 Marks)
- b. Explain various modes failures of an arch. (08 Marks)
- c. Highlight the important qualities of good flooring materials. (04 Marks)

OR

- 6 a. What are the factors to be considered while selecting a roof covering? (05 Marks)
- b. Explain different types of lintels. (05 Marks)
- c. What are the requirements of good roof? Draw a neat sketch of king post truss and show important elements. (10 Marks)

Module-4

- 7 a. Explain briefly the guidelines to be followed while locating doors and windows. (10 Marks)
b. What are the requirements of good stair? (05 Marks)
c. Discuss importance of formwork in constructional activity. (05 Marks)

OR

- 8 a. Plan a dog legged stair for a building in which the vertical distance between the floors is 3.6m. The stair hall measure $2.5\text{m} \times 5\text{m}$. (10 Marks)
b. Write short notes on the following :
i) Ranking shore
ii) Underpinning by pit method. (10 Marks)

Module-5

- 9 a. What are the objectives of plastering? Discuss the defects in plastering. (10 Marks)
b. Explain the method of applying :
i) Stucco plastering
ii) Lathe plastering. (10 Marks)

OR

- 10 a. What are the defects in painting? (08 Marks)
b. Explain different types of plaster finishes. (06 Marks)
c. What are the characteristics of ideal paint? (06 Marks)

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18CV35

Third Semester B.E. Degree Examination, July/August 2022 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. Enumerate the applications of surveying in civil engineering. (06 Marks)
- b. Discuss the classification of surveying. (08 Marks)
- c. The distance between two points A and B measured along slope is 504 m. Find the horizontal distance between A and B when,
 - (i) The angle of slope is 12°
 - (ii) The slope is 1 in 4.5
 - (iii) The difference in Elevation of A and B is 65 m (06 Marks)

OR

- 2 a. What is field book? List the points to be kept in mind while entering in field book. (08 Marks)
- b. A rectangular plot measures $20\text{cm} \times 30\text{cm}$ on a village map drawn to a scale of $1\text{ cm} = 100\text{ m}$. Calculate area in hectares. If it is redrawn on topo sheet to scale of $1\text{ km} = 1\text{ cm}$. What will be its area? Determine representative fraction in both the cases. (06 Marks)
- c. A survey line BAC crosses a river, A and C being on the near and distant banks respectively. A 50 m perpendicular line to AB is measured from "A". Bearing of "C" and "B" are 320° and 230° respectively. AB being 25 m. Find the width of the river. (06 Marks)

Module-2

- 3 a. Differentiate between :
 - (i) True meridian and magnetic meridian. (ii) WCB and QB
 - (iii) Fore bearing and back bearing. (06 Marks)
- b. Compute the bearings for setting out regular pentagon, if the bearing of line AB is $30^\circ 0'$. (06 Marks)
- c. The following bearing were observed in running a closed traverse. Determine the correct magnetic bearings of the lines. (08 Marks)

Line	FB	BB
AB	$38^\circ 30'$	$219^\circ 15'$
BC	$100^\circ 45'$	$278^\circ 30'$
CD	$25^\circ 45'$	$207^\circ 30'$
DE	$325^\circ 15'$	$145^\circ 15'$
EA	$190^\circ 30'$	$10^\circ 15'$

OR

- 4 a. Explain the following :
 - (i) Latitude and Departure (ii) Dependent and Independent co-ordinates (06 Marks)
- b. What is closing error? Explain Bowditch's method of adjusting the traverse. (06 Marks)
- c. Adjust the following traverse using transit rule: (08 Marks)

Line	AB	BC	CD	DE	EA
Latitude	62.96	67.60	-143.67	-104.97	118.57
Departure	63.33	209.10	47.05	-119.55	-199.70

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. Write a short note on Auto level. (05 Marks)
 b. Define the following terms:
 (i) Reduced level. (ii) Turning point (iii) MSL
 (iv) Back sight (v) H.I. (05 Marks)
 c. The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eighth readings. Enter readings and calculate RL of points by H.I method, if first reading was taken with a staff held on BM = 432.384 m.
 2.228 m, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 m (10 Marks)

OR

- 6 a. Explain differential leveling with a neat sketch. (06 Marks)
 b. Write a note on curvature and refraction correction. (06 Marks)
 c. Following details were recorded in level work. Calculate (i) True R.L of point "B"
 (ii) Angular error in collimation (iii) Combined correction for curvature and refraction.
 If distance between A and B is 1000 m. (08 Marks)

Instrument at	Staff reading on		Remarks
	A	B	
A	1.625	2.545	R.L.A = 100.80 m
B	0.725	1.405	

Module-4

- 7 a. What are the advantages and disadvantages of plane table surveying? (06 Marks)
 b. Describe briefly radiation method and intersection method of plane tabling. (10 Marks)
 c. Write short notes on orientation of plane table. (04 Marks)

OR

- 8 a. Explain the graphical method of solution of two point problem with sketches. (08 Marks)
 b. Describe the different forms of errors in plane table. (06 Marks)
 c. Briefly explain the working operation of plane table surveying. (06 Marks)

Module-5

- 9 a. Define contour. List any six characteristics of a contour with sketches. (08 Marks)
 b. Discuss the different methods of determining area. (04 Marks)
 c. A series of offsets were taken from a chain line to a curved boundary line at 10 m intervals in the following order: 3.25, 5.60, 4.20, 6.65, 8.75, 6.20, 3.25, 4.20, 5.65
 Calculate the area by,
 (i) Average ordinate rule. (ii) Trapezoidal rule
 (iii) Simpson's rule (08 Marks)

OR

- 10 a. A road embankment is 30 m wide at the top with side slopes of 2 : 1. The ground levels at 100 m intervals along a line AB are as under:
 A170.30, 169.10, 168.50, 168.10, 166.50B.
 The formation level at "A" is 178.70 m, with uniform falling gradient of 1 in 50 from A to B. Determine the volume of earth work by prismoidal rule. Assume the ground to be in cross section. (08 Marks)
 b. Explain Interpolation of contours. List the methods of contouring. (06 Marks)
 c. Write short notes on Digital planimeter. (06 Marks)

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18CV36

Third Semester B.E. Degree Examination, July/August 2022 Engineering Geology

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Explain briefly the Internal structure of the Earth. (08 Marks)
b. Explain the role of Geology in the field of Civil Engineering. (08 Marks)
c. Name the different branches of Geology which are related to Civil Engineering. (04 Marks)

OR

- 2 a. Define a Mineral. Briefly explain the physical properties of a Mineral. (12 Marks)
b. Describe any two of the following Minerals : (08 Marks)
i) Quartz ii) Hematite iii) Pyrite iv) Mica.

Module-2

- 3 a. Explain the different forms of Igneous Rocks with neat sketches. (12 Marks)
b. Enumerate the classification of Igneous Rocks. (08 Marks)

OR

- 4 a. What is Sedimentation? Explain the Primary Sedimentary structures, with neat sketches. (10 Marks)
b. What is Metamorphism? Explain the different kinds of Metamorphism with example. (10 Marks)

Module-3

- 5 a. Define the terms Dip , Strike and Outcrop. (06 Marks)
b. Explain with a neat sketch, Mural Joints and Columnar Joints. (06 Marks)
c. What are Folds? Explain briefly the different types of folds with neat sketches. (08 Marks)

OR

- 6 a. What are Faults? Name different types of faults. What are the Engineering considerations of faults in the Civil Engineering Projects? (10 Marks)
b. What are the factors considered for the selection of site for dams and reservoirs? (10 Marks)

Module-4

- 7 a. Explain the vertical distribution of ground water with a neat sketch. (10 Marks)
b. Define Aquifer. Explain briefly the different types of Aquifer, with a neat sketch. (10 Marks)

OR

- 8 a. Explain the ground water exploration by Electrical Resistivity method. (10 Marks)
b. Define the terms : (06 Marks)
i) Porosity ii) Permeability iii) Transmissibility.
c. Write short note on Flood control. (04 Marks)

Module-5

- 9 a. What are Earthquake? Add a note on causes and effects of Earthquake. (10 Marks)
b. Write short notes on :
i) Tsunami – causes and effects.
ii) Landslides – Causes and remedial measures. (10 Marks)
- OR**
- 10 a. What is Remote Sensing? What are its application in Civil Engineering? (08 Marks)
b. What is GIS? Name the different components of GIS. (06 Marks)
c. What are the applications of GPS in Civil Engineering? (06 Marks)

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18MAT41

Fourth Semester B.E. Degree Examination, July/August 2022 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

- Derive Cauchy-Riemann equation in Polar form. (06 Marks)
 - Find the analytic function $f(z)$ whose real part is $x \sin x \cosh y - y \cos x \sinh y$ (07 Marks)
 - If $f(z)$ is analytic show that
$$\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right] |f(z)|^2 = 4 |f'(z)|^2$$
 (07 Marks)

OR

- Find the analytic function $f(z)$ given that the sum of its real and imaginary part is $x^3 - y^3 + 3xy(x - y)$ (06 Marks)
 - Find the analytic function $f(z) = u + iv$ if $v = r^2 \cos 2\theta - r \cos \theta + 2$ (07 Marks)
 - If $f(z)$ is analytic function then show that
$$\left\{ \frac{\partial}{\partial x} |f(z)| \right\}^2 + \left\{ \frac{\partial}{\partial y} |f(z)| \right\}^2 = |f'(z)|^2$$
 (07 Marks)

Module-2

- State and prove Cauchy's Integral formula. (06 Marks)
 - Evaluate $\int_0^{2+i} z^2 dz$ along (i) the line $y = \frac{x}{2}$ (ii) The real axis to 2 and then vertically to $2 + i$. (07 Marks)
 - Find the bilinear transformation which maps the points 1, i , -1 onto the points i , 0 , $-i$ respectively. (07 Marks)

OR

- Discuss the transformation $w = e^z$, with respect to straight lines parallel to x and y axis. (06 Marks)
 - Using Cauchy's integral formula evaluate
$$\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$$
, where $c: |z| = 3$ (07 Marks)
 - Find the bilinear transformation which maps the points $0, 1, \infty$ on to the points $-5, -1, 3$ respectively. (07 Marks)

Module-3

- A random variable X has the following probability function for various values of X .

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k ²	2k ²	7k ² +k

Find i) k ii) $P(X < 6)$ iii) $P(3 < X \leq 6)$ (06 Marks)

- b. Out of 800 families with 5 children each, how many families would you expect to have
 (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atmost 2 girls, assuming equal probabilities for boys and girls. (07 Marks)
- c. The length in time (minutes) that a certain lady speaks on a telephone is a random variable with probability density function

$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find the value of the constant A. What is the probability that she will speak over the phone for (i) More than 10 minutes (ii) Less than 5 minutes (iii) Between 5 and 10 minutes.

(07 Marks)

OR

- 6 a. Find the constant C such that the function

$$f(x) = \begin{cases} Cx^2, & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases} \text{ is a probability density function. Also compute } P(1 < x < 2),$$

$$P(x \leq 1) \text{ and } P(x > 1)$$

(06 Marks)

- b. 2% fuses manufactured by a firm are found to be defective. Find the probability that the box containing 200 fuses contains

(i) No defective fuses (ii) 3 or more defective fuses (iii) At least one defective fuse.

(07 Marks)

- c. If x is a normal variate with mean 30 and standard deviation 5 find the probabilities that
 (i) $26 \leq x \leq 40$ (ii) $x \geq 45$ (iii) $|x - 30| > 5$

Given that $\phi(1) = 0.3413$, $\phi(0.8) = 0.2881$, $\phi(2) = 0.4772$, $\phi(3) = 0.4987$ (07 Marks)

Module-4

- 7 a. The following table gives the ages (in years) of 10 married couples. Calculate Karl Pearson's coefficient of correlation between their ages:

Age of husband (x)	23	27	28	29	30	31	33	35	36	39
Age of wife (y)	18	22	23	24	25	26	28	29	30	32

(06 Marks)

- b. In a partially destroyed laboratory record of correlation data only the following results are available:

Variance of x is 9 and regression lines are $8x - 10y + 66 = 0$, $40x - 18y = 214$. Find

- (i) Mean value of x and y
 (ii) Standard deviation of y
 (iii) Coefficient of correlation between x and y.

(07 Marks)

- c. Fit a parabola of the form $y = ax^2 + bx + c$ for the data

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(07 Marks)

OR

- 8 a. Obtain the lines of regression and hence find the coefficient of correlation of the data:

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

(06 Marks)

- b. Show that if θ is the angle between the lines of regression

$$\tan \theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2} \left(\frac{1 - r^2}{r} \right)$$

(07 Marks)

- c. Fit a straight line $y = a + bx$ to the data

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

(07 Marks)

Module-5

- 9 a. The joint probability distribution of the random variables X and Y is given below.

	Y	-4	2	7
X	1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
	5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Find (i) $E[X]$ and $E[Y]$ (ii) $E[XY]$ (iii) $\text{cov}(X, Y)$ (iv) $\rho(X, Y)$.

Also, show that X and Y are not independent.

(06 Marks)

- b. A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 of them were faulty. Test his claim at a significance level of 1% and 5% ($z_{0.05} = 1.96$, $z_{0.01} = 2.58$). (07 Marks)
- c. A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure ($t_{0.05}$ for 11 d.f. is 2.201) (07 Marks)

OR

- 10 a. Define the terms :
 (i) Null hypothesis (ii) Type-I and Type - II errors (iii) Significance level (06 Marks)
- b. In an experiment of pea breeding the following frequencies of seeds were obtained:

Round Yellow	Wrinkled Yellow	Round Green	Wrinkled Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in proportions 9:3:3:1

Is the experiment in agreement with theory ($\chi_{0.5}^2$ for 3 d.f is 7.815)

(07 Marks)

- c. The joint probability distribution of two discrete random variable X and Y is given by $f(x, y) = k(2x + y)$ where x and y are integers such that $0 \leq x \leq 2$, $0 \leq y \leq 3$. Find k and the marginal probability distribution of X and Y. Show that the random variables X and Y are dependent. Also, find $P(X \geq 1, Y \leq 2)$. (07 Marks)

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18CV42

Fourth Semester B.E. Degree Examination, July/August 2022 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. Explain with examples statically determinate and indeterminate structures. (08 Marks)
- b. Find the Static and Kinematic indeterminacies of the following structures.

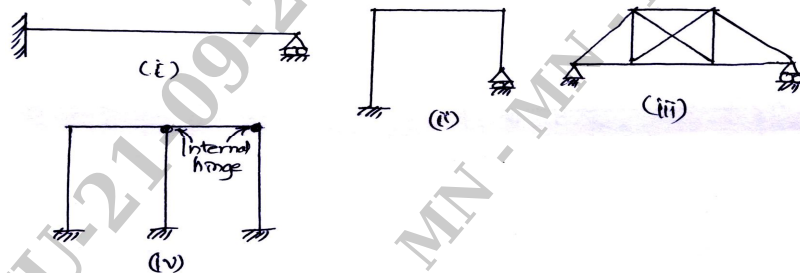


Fig.Q1(b)

(12 Marks)

OR

- 2 a. What do you mean by influence line diagram and state its applications. (08 Marks)
- b. Draw ILD for
 - (i) Reactions at supports of a simply supported beam.
 - (ii) Shear force of a simply supported beam carrying concentrated unit load. (12 Marks)

Module-2

- 3 a. Two point loads 4 kN and 6 kN spaced 6m apart cross a girder of 16m span, the 4 kN load, leading from left to right. Construct the maximum SF and BM diagrams stating the absolute maximum values. [Fig.Q3(a)].



Fig.Q3(a)

(10 Marks)

- b. Draw the influence line for SF and BM at a section 5m from the left hand support of a simply supported beam 25m span. Hence calculate maximum shear force and BM at this section due to uniformly distributed load of 1 kN/m, 8m long. [Refer Fig.Q3(b)]

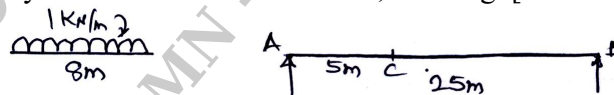


Fig.Q3(b)

(10 Marks)

OR

- 4 A simply supported beam of span 20m is subjected to a set of loads of magnitude of 20 kN, 30 kN, 15 kN and 10 kN spaced as shown with 10 kN leading. Determine the maximum BM at a section 5m from the left end and also the absolute maximum BM developed in the beam. [Refer Fig.Q4] (20 Marks)

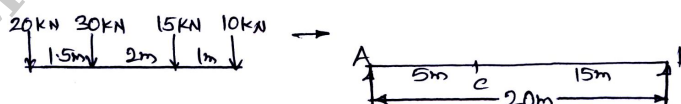


Fig.Q4

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. Determine the slope and deflection at the free end of a cantilever beam loaded as shown in the Fig.Q5(a). Take $EI = 4 \times 10^5 \text{ kNm}^2$. Use moment area method.

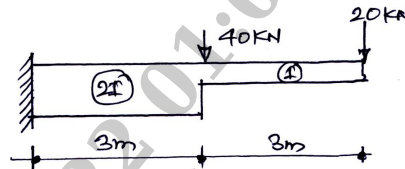


Fig.Q5(a)

(10 Marks)

- b. Determine the slope at C and deflection at D of a simply supported beam shown in Fig.Q5(b). Take $E = 200 \text{ GPa}$, $I = 2 \times 10^6 \text{ mm}^4$. Use conjugate beam method. (10 Marks)

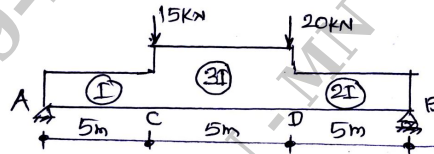


Fig.Q5(b)

OR

- 6 a. Determine the slope at the supports and deflection at the centre of a simply supported beam with a point load W at its mid span. Use moment area method. (10 Marks)
- b. Determine the slope at the supports and deflection at the centre of a simply supported beam with uniformly distributed load of W/m over the entire span. Use moment area method. (10 Marks)

Module-4

- 7 a. Derive the expression for strain energy stored in an prismatic element subjected to pure bending moment. (08 Marks)
- b. Determine the vertical deflection at C of a bent frame shown in the Fig.Q7(b). Use Castigliano's approach. Take $E = 200 \text{ GPa}$, $I = 80 \times 10^7 \text{ mm}^4$.

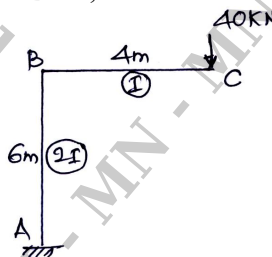


Fig.Q7(b)

(12 Marks)

OR

- 8 Determine the vertical and horizontal deflection of the point C, of the pin jointed frame shown in Fig.Q8. The cross sectional area of AB = 100 sqmm and BC and AC are 150 sqmm. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

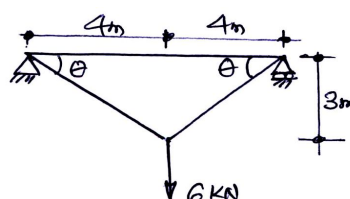


Fig.Q8

(20 Marks)

Module-5

- 9 A three hinged parabolic arch of 20m span with 4m central rise carries a point load of 4kN at 4m horizontally from the left hinge. Calculate the normal thrust and radial shear at a section just after the load. Also calculate the maximum positive and negative BM. Sketch BMD.

(20 Marks)

OR

- 10 A cable is of uniform section is suspended between two supports 100m apart. It carries a uniformly distributed load of 10 kN/m spread over the horizontal span. Find

- (i) Maximum and minimum tension in the cable.
(ii) Minimum cross sectional area of the cable required if the allowable stress is 300 MPa.
(iii) Length of the cable.

(20 Marks)

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18CV43

Fourth Semester B.E. Degree Examination, July/August 2022 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 repeating variables. What are the guidelines for selecting repeating variables? (06 Marks)
- b. Derive the scale ratios for the following quantities as per Froude model law:
(i) Velocity (ii) Discharge (iii) Force (iv) Pressure (08 Marks)
- c. A spillway model is constructed in the laboratory such that the velocity and discharge in the model are respectively 2 m/s and 2.5 m³/s. If the velocity in the prototype is 40 m/s, what is the scale ratio and the discharge in the prototype? (06 Marks)

OR

- 2 a. Define: (i) Meta center (ii) Metacentric height. Explain how these are used to check the stability of floating bodies. (06 Marks)
- b. The resisting torque T against the motion of a shaft in a lubricated bearing depends on viscosity μ , the rotational speed N, the diameter D and bearing pressure p. Show that $T = \mu ND^3 \cdot \phi \left[\frac{p}{\mu N} \right]$ where ϕ represents function. (08 Marks)
- c. Find the volume of water displaced and position of center of buoyancy for a wooden block of density 650 kg/m³ when it floats in water horizontally. The width of block is 2.5 m, depth is 1.5 m and length is 6m. (06 Marks)

Module-2

- 3 a. Distinguish between:
(i) Gradually varied flow and rapidly varied flow
(ii) Total energy and specific energy
(iii) Subcritical flow and supercritical flow (06 Marks)
- b. The discharge of water through a rectangular channel of 8m width is 16 m³/s when the depth of water is 1.2 m. Calculate:
(i) Specific energy
(ii) Critical depth and critical velocity
(iii) Minimum specific energy (06 Marks)
- c. For most economical trapezoidal section, prove that half of top width is equal to side slope length. Also show that hydraulic mean depth is equal to half of the flow depth. (08 Marks)

OR

- 4 a. List the conditions at critical point on specific energy curve. (04 Marks)
- b. Derive Chezy's equation for uniform rate of flow in a channel. Hence write Manning's equation. (08 Marks)
- c. A rectangular channel 6m wide and 1m depth of water has a bed slope of 1 in 900 and $n = 0.012$. Determine the discharge. What will be the dimensions of this channel for maximum discharge? Also compute percentage increase in discharge. (08 Marks)

Module-3

- 5 a. Define hydraulic jump. List the application of hydraulic jump. (04 Marks)
 b. Derive dynamic or differential equation for GVF. (08 Marks)
 c. A rectangular channel 8m wide discharges water with a depth of 0.4 m. If the critical depth of flow is 0.8 m, compute the depth of flow after jump, if jump occurs. Further, also calculate energy loss. (08 Marks)

OR

- 6 a. Give the flow depth condition for M1, S3, C1, H2 water surface profiles. (04 Marks)
 b. Derive the relationship between conjugate depths in case of a hydraulic jump in a rectangular channel. (08 Marks)
 c. A rectangular channel with bottom width 4m and bed slope 0.0008 has a discharge of 1.5 m³/s. The depth of flow at a certain section in GVF is 0.5 m. If n = 0.016, identify type of profile. (08 Marks)

Module-4

- 7 a. Define efficiencies of turbines and give relationship between them. (05 Marks)
 b. Show that the maximum efficiency of jet striking at the center of series of symmetrical curves vanes is $\eta_{\max} = \frac{1}{2}(1 + \cos\theta)$ (08 Marks)
 c. A pelton wheel turbine has to be designed for the following specification:
 Shaft power = 12000 KW, Head = 380 m, speed = 750 rpm, $\eta_0 = 85\%$, $d = \frac{D}{10}$, $C_v = 0.98$, $C_u = 0.45$. Determine: (i) Runner diameter (ii) Jet diameter (iii) Number of jets (07 Marks)

OR

- 8 a. State impulse-momentum equation. Give its applications. (04 Marks)
 b. Sketch and explain general layout of hydroelectric power plant. (06 Marks)
 c. A jet of water moving at 15 m/s impinges on a symmetrically curved moving vane tangentially to deflect the jet through 120°, the velocity of vane is 5 m/s. Find the angle of jet so that there is no shock. What is the absolute velocity of jet at exit in magnitude and direction? Also compute work done per N of water. (10 Marks)

Module-5

- 9 a. Define draft tube. List its functions. (04 Marks)
 b. Compute the minimum starting speed of a centrifugal pump having 90 cm and 45 cm as impeller diameters at outlet and inlet working against 10m head. (06 Marks)
 c. The inner and outer diameter of an inward flow Francis turbine are 0.6 m and 1 m, respectively. The width at both inlet and outlet is 12 cm. The head over the turbine is 9m. Hydraulic efficiency = 90%, Vane angle at outlet is 20° and discharge at outlet is radial with flow velocity of 2.7 m/s. Compute:
 (i) Guide blade angle (ii) Vane angle at inlet (iii) Speed of turbine
 (iv) Discharge (v) Water power (10 Marks)

OR

- 10 a. Explain with sketch various components of a centrifugal pump. (07 Marks)
 b. A centrifugal pump is to delivery 0.15 m³/s at a speed of 1450 rpm against a head of 25 m. The impeller diameter is 250 mm and width is 50 mm at outlet. $\eta_{\text{man}} = 75\%$. Determine the vane angle at the outer periphery of impeller. (08 Marks)
 c. Write a note of multistage centrifugal pumps. (05 Marks)

CBCS SCHEME

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18CV44

Fourth Semester B.E. Degree Examination, July/August 2022 Concrete Technology

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 types of cement. (10 Marks)
b. Explain the following :
i) Fly ash ii) Silico Fumes iii) Rice husk ash iv) GGBS. (10 Marks)

OR

- 2 a. Explain the constituents of cement with their percentages functioning. (10 Marks)
b. Explain the importance of size shape and texture of coarse aggregate on quality of concrete. (10 Marks)

Module-2

- 3 a. List and explain the factors affects the workability of concrete. (10 Marks)
b. Enumerate good and bad practices of making and using of Fresh concrete. (10 Marks)

OR

- 4 a. Explain the process of hydration of cement. Enumerate its significance and the chemical reaction. (10 Marks)
b. Write short notes :
i) Segregation ii) Membrane curing. (10 Marks)

Module-3

- 5 a. Explain the factors affecting the strength of concrete. (10 Marks)
b. What is the Necessity of Non Distractive Testing (NDT)? Explain any two methods of NDT. (10 Marks)

OR

- 6 a. Mention the types of Shrinkage. Explain factor affecting Shrinkage. (10 Marks)
b. Explain Sulphate attack and chloride attack. (10 Marks)

Module-4

- 7 a. What are the objectives of mix design? Explain the factors to be considered for mix design. (10 Marks)
b. Mention different method of mix design; explain the factor affecting the choice of mix proportions. (10 Marks)

OR

- 8 Design a concrete mix of M₂₅ grade as per IS 10262-2019, with the following stipulations.
- Grade designation – M₂₅
 - Type of cement OPC 43 grade
 - Maximum Nominal size of aggregate 20mm down
 - Minimum cement content : 300 Kg/m³
 - Workability : Slump : 75mm
 - Exposure condition : moderate
 - Method of concrete placing : Manual
 - Maximum cement content : 450Kg/m³
 - Chemical admixture : NIL
 - Fine aggregate zone : zone 2
- A. Specific gravity of cement : 3.15
- B. Coarse aggregate
- Specific gravity 2.80
 - Water absorption 1%
 - Free surface moisture content : NIL
- C. Fine aggregate
- Specific gravity 2.65
 - Water absorption 2%
 - Free surface moisture contact : 2%
- (20 Marks)

Module-5

- 9 a. Enumerate the necessity of RMC with advantages and disadvantages. (10 Marks)
- b. Write short notes on :
- Geopolymer concrete
 - High performance concrete. (10 Marks)

OR

- 10 a. List the types of Fibres used in FRC and discuss factors affecting properties of FRC. (10 Marks)
- b. What is self compacting concrete? Explain the properties of SCC. (10 Marks)

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18CV45

Fourth Semester B.E. Degree Examination, July/August 2022 Advanced Surveying

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- a. Explain the procedure of measuring horizontal angle by Repetition and Reiteration method. (08 Marks)
- b. Define the following terms:
(i) Centring (ii) Transiting (iii) Changing face
(iv) Swinging (v) Line of collimation (06 Marks)
- c. Write the short notes on step by step procedure for obtaining permanent adjustment of transit theodolite. (06 Marks)

OR

- a. To find the elevation of the top (Q) of a hill, a flag staff of 2 m height was erected and observations were made from 2 stations P and R, 60 m apart. The horizontal angle measured at P between R and the top of the flat staff was $60^{\circ} 30'$ and that measured at R between the top of the flags staff and P was $68^{\circ} 18'$. The angle of elevation to the top of the flag staff was measured to be $10^{\circ} 12'$ at P. The angle of elevation to the top of the flag staff was measured to be $10^{\circ} 48'$ at R. Staff readings on B.M. when the instrument was at P = 1.965 m and that with the instrument at R = 2.055 m. Calculate the elevation of the top of the hill if that of B.M. was 435.065 m. (10 Marks)
- b. Derive expression for determining the distance and elevation of an inaccessible object by single plane method. Assume instrument axes at the same level and different level. (10 Marks)

Module-2

- a. Derive distance and elevation formulae for stadia tachometry, when staff held normal to the line of sight, for both an angle of elevation and angle of depression. (10 Marks)
- b. Determine the gradient from point A to a point B from the following observations made with a tacheometer fitted with an anallactic lens. The constant of the instrument was 100 and the staff was held vertically,

Inst Station	Staff point	Bearing	Vertical angle	Staff readings
P	A	134°	$+10^{\circ} 32'$	1.360, 1.915, 2.470
	B	224°	$+5^{\circ} 36'$	1.065, 1.885, 2.705

(10 Marks)

OR

- a. List the various factors that are to be considered in the selection of site for baseline in triangulation survey. (04 Marks)
- b. Write the objectives of Geodetic Triangulation and briefly explain the various triangulation figures adopted in triangulation survey with neat sketch. (10 Marks)
- c. From an eccentric station S, 12.25 m to the west of the 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 the opposite sides of the line AB. Calculate the correct angle ABC if the lengths AB and BC are 5286.5 m and 4932.2 m respectively. (06 Marks)

Module-3

- 5 a. With the help of neat sketch of a simple circular curve, explain (i) point of curve (ii) deflection angle (iii) tangent length (iv) length of the long chord (v) Apex distance (vi) Mid ordinate (06 Marks)
- b. Two tangents AB and BC intersect at a point B at chainage 2760 m. Calculate all the necessary data for setting out a curve of 573 m radius and deflection angle 30° by the method of ordinates from long chord at 30 m interval. (08 Marks)
- c. Two straights AB and BC are intersected by a line D_1D_2 . The angles AD_1D_2 and CD_2D_1 are $139^\circ 30'$ and $143^\circ 36'$ respectively. The radius of the first arc is 600 m and that of the second arc is 800 m. If the chainage of the second arc is 800 m. If the chainage of Intersection point B is 8248.1. Find the chainage of the tangent points and the Point of Compound Curvature (P.C.C). (06 Marks)

OR

- 6 a. Two parallel railway lines are to be connected by a reverse curve, each section having the same radius. If the lines are 12 m apart and the maximum distance between tangent points measured parallel to the straights is 48 m, find the maximum allowable radius. If however, both the radius are to be different, calculate the radius of the second branch if that of the first branch is 60 m. Also calculate the length of both the branches. (10 Marks)
- b. What are the requirements of an essential transition curve? (06 Marks)
- c. With a neat sketch, list any four vertical curves. (04 Marks)

Module-4

- 7 a. A vertical photograph was taken at an altitude of 1200 m above mean sea level. Determine the scale of the photograph for terrain lying at elevations of 80 m and 300 m if the focal length of the camera is 15 cm. (08 Marks)
- b. Derive the expression for relief displacement on a vertical photograph. (06 Marks)
- c. List the reasons for keeping overlap in photographs. (06 Marks)

OR

- 8 a. Define (i) Vertical photograph (ii) Tilted photograph (iii) Oblique photograph. (06 Marks)
- b. Write short note on : (i) Stereoscope (ii) Parallax Bar (iii) Mosaics (08 Marks)
- c. The scale of an aerial photograph is 1 cm = 160 m and the size of the photograph is 20 cm × 20 cm. If the longitudinal lap is 65% and side lap is 35%, determine the number of photographs required to cover an area of 232 sq.km. (06 Marks)

Module-5

- 9 a. Mention the advantages of total station and describe its working principle. (08 Marks)
- b. With neat sketch, explain the electromagnetic spectrum. (06 Marks)
- c. Explain the interaction of electromagnetic waves with atmosphere. (06 Marks)

OR

- 10 a. Define Remote Sensing? Explain the stages of idealized remote sensing system. (08 Marks)
- b. With a neat sketch, explain the components of GIS. (06 Marks)
- c. List out the application of GIS and Remote Sensing. (06 Marks)

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18CV46

Fourth Semester B.E. Degree Examination, July/August 2022 Water Supply and Treatment 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 various types of water demand. (06 Marks)
b. Discuss the factors that affect per capita demand. (08 Marks)
c. Calculate the fire demand for 2 lakh population by different formula. (06 Marks)

OR

- 2 a. What is population forecasting? List any eight methods of population forecasting. Explain the incremental increase and comparative graphical method. (10 Marks)
b. The following is the population data of a city available from past census records. Determine the future population of the city in 2040 by
i) Arithmetical increase method
ii) Geometrical increase method.

Year	1970	1980	1990	2000	2010
Population	25,000	28,000	34,000	42,000	47,000

(10 Marks)

Module-2

- 3 a. Give complete sequence of a water treatment plant with a flow diagram and mention the significance of each unit. (08 Marks)
b. Briefly explain different methods of water sampling. (06 Marks)
c. Give the drinking water quality standards as per BIS for the following parameters. Discuss their effects when they are excluding their limits. i) Iron ii) Chlorides iii) Fluoride iv) Nitrate. (06 Marks)

OR

- 4 a. Explain the factors to be considered while selecting a site for intake structures. (06 Marks)
b. What are intake structures? List the different types of intakes and explain any one, with neat sketch. (08 Marks)
c. List the different types of aeration process and explain any one, with neat sketch. (06 Marks)

Module-3

- 5 a. Briefly explain the term i) Sedimentation ii) Coagulation iii) Clarification. (06 Marks)
b. How you will determine the optimum coagulant dosage in lab using Jar test apparatus? Discuss with sketch. (07 Marks)
c. The maximum daily demand at a water purification tank plant is 12MLD. Design the dimensions of a suitable rectangular sedimentation tank for the raw water supplies. Take detention time period of 6 hours and the depth of 4.0mts. The velocity of flow is 20cm/min. (07 Marks)

OR

- 6 a. Briefly explain theory of filtration. (06 Marks)
 b. With the help of a neat sketch, explain the working of rapid gravity filter. (08 Marks)
 c. Determine the dimensions of a set of rapid gravity filters for treating water required for a population of 50,000 with average rate of demand as 180 litres per day per person. Assume a peak factor of 1.8 by ignoring wash water requirements. Assume rate of filtration is 5000l/h/sq.m. (06 Marks)

Module-4

- 7 a. Explain theory of chlorination of water with chemical equation. (06 Marks)
 b. Explain break point chlorination graphically. (06 Marks)
 c. Estimate the quantity a bleaching powder required for a city water tank, for one month (31 days), use the following data:
 Population: 1 lakh
 Strength of bleaching powder: 20%
 Chlorine demand of water: 0.4mg/l
 Residual chlorine required: 0.2mg/l
 Rate of water supply: 250 liter/capita/day. (08 Marks)

OR

- 8 a. Explain the zeolite process of water softening with sketch. Write down the relevant chemical equation. (10 Marks)
 b. Explain with a line diagram the “Nalagonda Technique” of defluridation. (06 Marks)
 c. Explain reverse osmosis process of softening of water. (04 Marks)

Module-5

- 9 Briefly explain the following with the help of neat sketch.
 a. Economical diameter of raising main
 b. Sluice valve
 c. Air valve
 d. Fire hydrant. (20 Marks)

OR

- 10 a. Discuss the various methods of distribution system. (06 Marks)
 b. With sketches, explain briefly dead end system and grid iron system of distribution networks. (08 Marks)
 c. Briefly explain the surface and elevated reservoirs. (06 Marks)

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18CV51

Fifth Semester B.E. Degree Examination, July/August 2022 Construction Management and Entrepreneurship

Time: 3 hrs.

Max. Marks: 100

- Note :** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Normal Distribution function table is permitted.

Module-1

- 1 a. What are the functions of Management? Explain any four of them. (08 Marks)
b. The activity data of a project is given in the table below :

Activity	Preceding Activity	Duration (Days)
A	-	10
B	-	9
C	A	9
D	A	8
E	B	7
F	B	11
G	D, E	5

Draw the Network diagram, identify and critical path and project duration using CPM.

(08 Marks)

- c. Discuss the characteristics of Autocratic Management Styles.

(04 Marks)

OR

- 2 a. Below given table pertains to the list of activities and their time estimates of a Job.

Activity	Optimistic Time (Days)	Most likely time (Days)	Pessimistic Time (Days)
1 - 2	3	7	10
1 - 3	4	8	13
2 - 4	2	2	7
3 - 4	5	8	10

- i) Draw the Network and determine the critical path.
ii) What is the expected completion time with the probability of 85% (Take Probability factor (Z) = 1.038)? (10 Marks)
b. Discuss on types of Project plans. (06 Marks)
c. Explain the Grant chart with sketch. (04 Marks)

Module-2

- 3 a. What are the factors affecting the Labour output? (08 Marks)
b. Estimate the hourly production in bulk volume (LCM) of a backhoe with bucket capacity of 1.14m^3 that is employed on excavation of a foundation, which is 3m deep in hard digging soil. The excavated earth is to be loaded in waiting dump trucks, placed at a swing angle of 75° . The expected performance efficiency is 81% with the following data.
i) Ideal output of loose soil in M^3 (LCM) = 180 LCM.
ii) Equipment conversion factor operating at optimum depth = 0.80.
iii) Correction factors are : Soil factor per hard digging = 0.67 ;
Load factor for loading into vehicle = 0.80 ; Swing factor = 1.05. (08 Marks)
c. Discuss on Class of Labour. (04 Marks)

OR

- 4 a. Enumerate the classification of Construction equipment with sub class. (10 Marks)
 b. What are the functions of Material Management? (05 Marks)
 c. A Company has purchased an equipment whose first cost is Rs 1,50,000 with an estimated life of eight years. The estimated salvage value of the equipment at the end of life time is Rs 25,000. Determine the depreciation and the book value for period 4 using the Straight Line method of depreciation. (05 Marks)

Module-3

- 5 a. Define Quality and describe Quality Control and Quality Assurance in Construction. (08 Marks)
 b. Explain the Total Quality Management process in Construction. (08 Marks)
 c. Discuss on need of Engineering ethics. (04 Marks)

OR

- 6 a. What are the Safety procedures to be adopted during Excavation? (06 Marks)
 b. Explain Safety through Legislation , Safety campaign and Insurances. (08 Marks)
 c. Briefly write about : i) Gifts and bricks ii) Whistle blowing. (06 Marks)

Module-4

- 7 a. 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 Estimates		
	Initial cost (Rupees)	Service Life (Years)	Annual operation and Maintenance cost (Rupees)
Company X	10, 50, 000	15	60,000
Company Y	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 iii) Marginal cost iv) Opportunity cost v) Capitalized cost. (10 Marks)
 b. Determine the effective interest rate for a nominal annual rate of 6 percent that is compounded : i) Semi annually ii) Quarterly iii) Monthly iv) Daily. (10 Marks)

Module-5

- 9 a. Write briefly about four functions of an Entrepreneur. (04 Marks)
 b. Summarize the role of MSME in Economic development. (08 Marks)
 c. Discuss in detail about stages in Entrepreneurial process. (08 Marks)

OR

- 10 a. Write short note on Exporting. (04 Marks)
 b. Discuss the different types of Feasibility study. (08 Marks)
 c. Explain the scope and role of following agencies : i) KIADB ii) KSFC. (08 Marks)

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Fifth Semester B.E. Degree Examination, July/August 2022 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. IS456-200 and SP(16) is allowed.

Module-1

- 1 a. Explain the philosophy and principals of Limit state method of design. (08 Marks)
b. Write brief note on :
i) Partial safety factors for load and material
ii) Characteristics load
iii) Characteristics strength (06 Marks)
c. Explain balanced, under reinforced and over-reinforced sections. (06 Marks)

OR

- 2 a. Differentiate between working stress method and limit state method of RCC designs. (06 Marks)
b. A rectangular section beam 200mm wide by 450mm overall depth is reinforced with 3 bars of 16mm diameter at an effective depth of 420mm. Two hanger bars of 12mm diameter are provided at the expression face. The effective span of the beam is 5m. The beam supports a service load of 10kN/m. If $f_{ck} = 20\text{N/mm}^2$ and $f_y = 415\text{N/mm}^2$. Compute : i) The short term deflection ii) The long term deflection. (14 Marks)

Module-2

- 3 a. A singly reinforced beam 250mm \times 500mm is reinforced with 4 bars of 16mm diameter with an effective cover of 50mm. Effective span of the beam is 6m. Assuming M₂₀ grade concrete and Fe415 steel determine central concentrated load 'P' that can be carried by the beam in addition to its self weight. (10 Marks)
b. Determine the area of reinforcement required for a singly reinforced concrete section having breadth of 300mm and effective depth 600mm to resist a factored moment of 200kN-m. Take $f_{ck} = 20\text{N/mm}^2$ and $f_y = 415\text{N/mm}^2$. (10 Marks)

OR

- 4 a. A RCC beam 300mm \times 500mm is reinforced with 4 bars of 16mm diameter with an effective cover of 50mm. The beam is simply supported over a span of 5m. Find the maximum permissible udl on the beam. Use M₂₀ grade concrete and Fe500 steel. (10 Marks)
b. Calculate the moment of resistance of RCC rectangular section 250mm wide and 500mm deep. If is reinforced with 6 bars of 20mm diameter on tension side and 3 bars of 20mm diameter on compression side. The effective cover for both tension and compression reinforcement is 40mm. Use M₂₀ grade concrete and Fe415 steel for the design. (10 Marks)

Module-3

- 5 Design a cantilever beam having 1.1m projection. The live load on the beam is 6kN/m use M₂₅ concrete and Fe415 steel for the design. (20 Marks)

OR

- 6 A T-beam slab floor has a slab 150mm thick spanning between T-beams which are spaced at 3m center to center. The beam is having clear span of 10m. The end bearings are 450mm thick. The live load on the floor is 4kN/m^2 . Using M_{20} concrete and Fe415 steel design one of the intermediate beam (20 Marks)

Module-4

- 7 Design a slab for a room size $7\text{m} \times 3\text{m}$ which carries a live load of 2.5kN/m^2 . Use M_{20} concrete and Fe 415 steel for the design. (20 Marks)

OR

- 8 Design a dog legged stair case for a room $2.5 \times 4.5\text{m}$. The floor to floor height is 3.2m. Take live load 3kN/m^2 . Assume bearing 230mm. Use M_{20} concrete and Fe415 steel for the design. (20 Marks)

Module-5

- 9 a. Determine reinforcement to be provided in a square column subjected to biaxial bending with following details.

- i) Size of the column = $450\text{mm} \times 450\text{mm}$
- ii) Concrete M_{25}
- iii) Steel : Fe415
- iv) Factored moment = 200kN-m
- v) Factored load = 2500kN

If the arrangement of steel i) on two sides ii) on four sides. (12 Marks)

- b. Determine the reinforcement to be provided in a short column subjected to biaxial bending with the following data :

- i) Size of the column = $400\text{mm} \times 600\text{mm}$
- ii) Concrete mix = M_{25}
- iii) Characteristics strength of steel = 415N/mm^2
- iv) Factored load $P_u = 1600\text{kN}$
- v) Factored moment acting parallel to the longer direction $m_{ux} = 120\text{kN-m}$
- vi) Factored moment acting parallel to the dimension $M_{uy} = 90\text{kN-m}$.

(08 Marks)

OR

- 10 Design a rectangular footing for a column $400 \times 600\text{mm}$ to carry a axial load of 1500kN . The safe bearing capacity of soil is 180kN/m^2 . Take M_{20} concrete and Fe415 steel for the design. (20 Marks)

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Fifth Semester B.E. Degree Examination, July/August 2022 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. With the help of 3-phase diagram define: void ratio, porosity, water content and degree of saturation. (08 Marks)
- b. Derive from first principles, the following phase relation:

$$\gamma_d = \frac{(1 - n_a)G \cdot \gamma_w}{1 + wG}$$
 (06 Marks)
- c. With the help of particle size distribution curve explain well graded soil, uniformly graded soil and gap graded soil. (06 Marks)

OR

- 2 a. Explain plasticity chart with a neat sketch and its use in classification of fine grained soil. (08 Marks)
- b. How many cubic meters of soil can be formed with a void ratio of 0.5 from 100 cubic meters of soil having void ratio of 0.7? (06 Marks)
- c. A soil sample consisting of particles size ranging from 0.5mm to 0.01mm is put on the surface of still water tank 5 mts deep. Calculate the time of settlement of the coarsest and finest particles of the sample to the bottom of the tank. Assume average specific gravity of soil particles as 2.66 and viscosity of water as 0.01 poise. (06 Marks)

Module-2

- 3 a. Explain with sketches the various soil structures. (06 Marks)
- b. Explain any two clay minerals with the help of neat sketches. (08 Marks)
- c. List and explain the factors affecting compaction. (06 Marks)

OR

- 4 a. What are the differences between standard and modified Proctor's compaction tests? (06 Marks)
- b. Explain Electrical diffused double layer and adsorbed water. (06 Marks)
- c. The observations of a standard Proctor's compaction test are as follows:

Dry density kN/m ³	16.16	17.06	18.61	18.95	18.78	17.13
Water content, %	5	8.81	11.25	13.05	14.40	19.25

Plot the compaction curve and determine OMC and $\gamma_{d \max}$. Also compute void ratio and degree of saturation at optimum condition. Take $G = 2.77$. (08 Marks)

Module-3

- 5 a. Define Darcy's law. Derive the relationship between discharge velocity and seepage velocity. (06 Marks)
- b. Derive an expression to obtain coefficient of permeability under falling head condition. (06 Marks)
- c. A clay structure of thickness 8m is located at a depth of 6m below the ground surface. It is overlaid by fine sand and the water table is located at a depth of 2m below ground surface. For fine sand submerged unit weight is 10.2kN/m³. The moist unit weight of sand located above water table is 16kN/m³. For clay layer $G = 2.76$ and $w = 25\%$. Compute the effective stress at the middle of clay layer. (08 Marks)

OR

- 6 a. What is a flownet? Briefly explain the characteristics and uses of flownets. (08 Marks)
 b. Explain the terms: Total stress, effective stress and neutral stress. (06 Marks)
 c. Calculate the coefficient of permeability of a soil sample, 6 cms in height and 50cm^2 in cross-sectional area, if a quantity of water equal to 430cc passed down in 10 minutes, under an effective constant head of 40cms. On oven drying the test specimen has a mass of 498gms. Taking the specific gravity of soil solids as 2.65, calculate the seepage velocity of water during the test. (06 Marks)

Module-4

- 7 a. Explain Mohr-Coulomb theory of shear strength. (06 Marks)
 b. Explain the advantages and disadvantages of direct shear test over triaxial shear test. (06 Marks)
 c. An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38mm and was 80mm long. The load at failure was measured as 30N and the axial deformation of the sample at failure was 12mm. Determine the unconfined compressive strength and undrained shear strength of clay. (08 Marks)

OR

- 8 a. Explain sensitivity and thixotropy. (06 Marks)
 b. Explain Vane shear test with a neat sketch. (06 Marks)
 c. The triaxial tests carried out on soil samples gave the following results:

Confining Pressure., kN/m^2	50	100	150
Deviator stress, kN/m^2	76	132	186
Pore water Pressure., kN/m^2	35	59	83

Plot Mohr's circle and obtain effective shear parameters.

(08 Marks)

Module-5

- 9 a. Explain spring analogy theory of consolidation of soil. (06 Marks)
 b. What is preconsolidation pressure? How it is determined by Casagrande's graphical method? (06 Marks)
 c. An undisturbed sample of clay, 24mm thick, consolidated 50% in 20 minutes, when tested in laboratory with drainage allowed at top and bottom. The clay layer from which the sample was obtained is 4m thick in field. How much time will it take to consolidate 50% with double drainage? If the clay stratum has only single drainage, calculate the time to consolidate 50%. Assume uniform distribution of consolidation pressure. (08 Marks)

OR

- 10 a. Explain pre consolidated, normally consolidated and underconsolidated soil. (06 Marks)
 b. With a neat sketch, explain the square root of time fitting method of determining coefficient of consolidation. (06 Marks)
 c. In a consolidation test the void ratio of soil sample decreases from 1.20 to 1.10, when the pressure is increased from 160 to 320kN/m^2 . Determine coefficient of consolidation if the coefficient of permeability is $8 \times 10^{-7}\text{mm/s}$. (08 Marks)

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18CV55

Fifth Semester B.E. Degree Examination, July/August 2022 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 the Need of Sanitation. (04 Marks)
- b. Explain the method of sewage disposal with advantages and disadvantages. (10 Marks)
- c. Explain the principles of good house drainage. (06 Marks)

OR

- 2 a. Explain the time of concentration with its components. (08 Marks)
- b. Assuming that the surface on which the rainfalls in a district is classified as follows :
20% of the area consists of roof for which the runoff ratio is 0.9, 20% of the area consists of pavements for which the runoff ratio is 0.85, 5% of the area consists of paved yards of houses for which runoff is 0.80, 15% of area consists of macadam roads for which run off ratio is 0.40, 35% of the area consists of lawns, gardens and vegetable plants for which the runoff ratio is 0.10 and the remaining 5% of the area is wooded for which the runoff ratio is 0.05, determine the co-efficient of runoff for the area. If the total area of the district is 36 hectares and the maximum rain intensity is taken as 5cm/hr, what is the total run off for the district? (08 Marks)
- c. What is wet weather flow? Discuss the factors affecting wet weather flow. (04 Marks)

Module-2

- 3 a. Explain briefly :
 - i) Self cleaning velocity
 - ii) Non-scouring velocity. (08 Marks)
- b. State hydraulic elements for circular sewer for full flow and half flow conditions. (12 Marks)

OR

- 4 a. With neat sketch flow diagram, explain unit operation and process of Municipal Waste Water Treatment. (06 Marks)
- b. The BOD₅ of a waste water is 150mg/l at 20°C, the 'K' value is known to be 0.23 per day, what would BOD₈ be if the test was run at 15°C? (08 Marks)
- c. Explain the physical, chemical and biological characteristics of waste water. (06 Marks)

Module-3

- 5 a. Discuss briefly with neat sketch Grit Chamber, oil and grease removal tank, screen's and its types. (12 Marks)
- b. Explain self purification of natural water bodies; also explain various factors affecting self purification. (08 Marks)

OR

- 6 a. Discuss zones of purification with neat sketch. (08 Marks)
- b. A city discharges 1500 litres 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 B.O.D at 20°C for sewage is 200mg/l and that of river water is 1 mg/lit. The D.O. content of sewage is zero and that of the stream is 90% of the saturation D.O. If the minimum 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 re-oxygenation co-efficient as 0.3. (12 Marks)

Module-4

- 7 a. With a neat diagram, explain activated sludge process. (08 Marks)
- b. Explain with neat sketch the working of trickling filter. What is the principle on which it is working? (08 Marks)
- c. Explain rotating biological contactor. (04 Marks)

OR

- 8 a. Explain principle of stabilization ponds with a diagram. (08 Marks)
- b. Explain : (12 Marks)
- Thickness
 - Drying Bed
 - Equalization.

Module-5

- 9 a. Discuss in briefly Nitrification and Denitrification process. (04 Marks)
- b. Explain with neat sketch electro coagulation method. (08 Marks)
- c. What do you mean by low cost treatment and explain various methods involved in cost treatment. (04 Marks)

OR

- 10 a. Discuss in briefly : (10 Marks)
- Eco – toilet
 - Soak pits.
- b. Design the dimensions of a septic tank for a small colony of 150 persons provided with an assured water supply from the municipal head works at a rate of 120 liters per person per day. Assume any data, you may need. (10 Marks)

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CBCS SCHEME

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18CV56

Fifth Semester B.E. Degree Examination, July/August 2022 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. Briefly explain the following:
- Characteristic of road transport.
 - Indian Road Congress.
 - Central Road Research Institute. (10 Marks)
- b. Briefly explain the salient features of 3rd and 4th 20 year road development plans in India. (10 Marks)

OR

- 2 a. List the factors affecting the alignment. Briefly explain the engineering surveys for highway alignment. (10 Marks)
- b. Determine the length of different categories of roads in a state in India by the year 2001, using the third road development formula and the following data:
- Total area of the state = 80,000 sq.km
Total number of towns as per 1981 census = 86
Overall road density aimed at = 82 km/100 sq. km area. (10 Marks)

Module-2

- 3 a. Define friction. List the factors affecting friction or skid resistance. (05 Marks)
- b. Define Camber. List and write neat sketches of different shapes of Camber. (05 Marks)
- c. Define superelevation. Derive an expression for superelevation with neat sketch. (10 Marks)

OR

- 4 a. Define transition curve and list the functions of transition curves in the horizontal alignment of highway. (05 Marks)
- b. Calculate the minimum sight distance required to avoid a head-on collision of two cars approaching from the opposite directions at 90 and 60kmph. Assume a reaction time of 2.5 seconds, coefficient of friction is 0.7 and a brake efficiency of 50 percent in both the cases. (07 Marks)
- c. The speeds of overtaking and over taken vehicles are 70 and 40kmph respectively on a two way traffic road. The average acceleration during overtaking may be assumed as 0.99m/sec^2 .
- Calculate safe overtaking sight distance.
 - What is the minimum length of overtaking zone?
 - Draw a neat sketch of the overtaking zone and show the positions of the sign posts. (08 Marks)

Module-3

- 5 a. Explain briefly the desirable properties of subgrade soil. (06 Marks)
 b. List the various properties of road aggregates and the tests to be conducted to find each property of aggregate. (06 Marks)
 c. What are the various tests carried out on Bitumen? Briefly mention the uses of each test. (08 Marks)

OR

- 6 a. Briefly outline the advantages and limitations of rigid pavement. (04 Marks)
 b. Draw a sketch of flexible pavement cross section and show the component parts. Enumerate the functions of each component of the pavement. (08 Marks)
 c. Explain ESWL with sketch. Briefly explain the graphical method of determination of ESWL for dual wheel assembly. (08 Marks)

Module-4

- 7 a. With a neat sketch, explain the method of determining the aggregate-bituminous mixes proportioning by Rothfuch's method. (10 Marks)
 b. What do you understand by wet-mix macadam? Briefly explain construction steps and quality control checks during the construction of WMM base course. (10 Marks)

OR

- 8 a. Explain the various steps in the construction of Dense Bituminous Macadam pavement. (10 Marks)
 b. Explain step by step, the procedure of Dry Lean Concrete sub base course. (10 Marks)

Module-5

- 9 a. What are the requirements of Highway Drainage system? (05 Marks)
 b. Briefly explain with neat sketches:
 i) Lowering of water table
 ii) Control of seepage flow. (10 Marks)
 c. Briefly explain the procedure for design of filter material. (05 Marks)

OR

- 10 a. 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	100	6
Earth work	40	40	8
Bridges, culvert and drainage	50	60	8
Pavement	100	15	10
Traffic signs and real appurtenances	15	5	10

- The average cost of maintenance of the road is Rs.1.5 lakhs per year. (10 Marks)
 b. List the factors to be considered for evaluation of vehicle operation cost. (05 Marks)
 c. List the advantages of implementing road projects through public private partnership modes. (05 Marks)

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GBCS SCHEME

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18CV61

Sixth Semester B.E. Degree Examination, July/August 2022 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. Use of IS 800-2007, steel table is permitted.

Module-1

- a. What are the advantages and disadvantages of steel structures? (10 Marks)
b. Distinguish between working stress design and limit state design of steel structures. (10 Marks)

OR

- a. Calculate the shape factor of triangle. (10 Marks)
b. Calculate 'M_p' for the continuous beam shown in Fig.Q2(b). Take load factor 1.5.

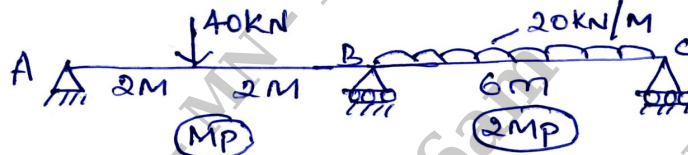


Fig.Q2(b)

(10 Marks)

Module-2

- a. Explain the failure modes of bolted connection. (10 Marks)
b. Design a bolted connection for a lap joint of plate thickness 16 mm and 12 mm to carry a factored load of 160 kN. Use M₁₆ and 4.6 grade bolts. (10 Marks)

OR

- a. What are the advantages and disadvantages of welded connection? (10 Marks)
b. A tie member of Truss consisting of angle section ISA 65 × 65 × 6 mm of Fe 410 grade is welded to 8 mm gusset plate. Design a weld to transmit a factored load of 150 kN. (10 Marks)

Module-3

- a. Explain the failure modes of axial loaded column. (10 Marks)
b. Determine the design compressive strength of ISHB300@576.8 N/m, Length of column is 3.5 m and both ends are pinned. (10 Marks)

OR

- Design a single angle discontinuous strut to carry a factored load of 65 kN. The length of strut is 3m, between inter section. It is connected to 12 mm thick gusset plate by 20 mm diameter, 4.6 grade bolts. (20 Marks)

Module-4

- a. Explain the factors effecting strength of tension members. (10 Marks)
b. Design a tension member to carry factored load of 400 kN connected to shorter leg back to back. Length of member is 3m. (10 Marks)

OR

- 8 a. Explain Lug angles and column splices. (10 Marks)
b. Design slab base for a column made of ISHB250@536 N/m to carry axial working load of 520 kN. The grade of concrete is M₂₀ and grade of steel Fe 410. (10 Marks)

Module-5

- 9 a. Explain the factors effecting lateral stability of beams. (10 Marks)
b. Calculate the load carrying capacity of laterally restrained simply supported beam with ISMB500@86.9 kg/m section for an effective span of 5m. (10 Marks)

OR

- 10 Design a steel beam section for supporting hall for the following data:
Clear span = 6.5 m
End bearing = 200 mm
c/c spacing of beams = 3 m
Live load on beams = 12 kN/m²
Dead load = 3 kN/m²

(20 Marks)

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Sixth Semester B.E. Degree Examination, July/August 2022 Applied Geotechnical Engineering

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. What is sub-surface exploration? What are the objectives of soil exploration? (07 Marks)
b. With a neat sketch explain seismic refraction method. (07 Marks)
c. Determine the area ratios for the following soil sampler and comment the nature of samples obtained in each samplers
i) Core cutter 185mm OD 135mm ID
ii) Split Barrel 51mm OD 45mm ID
iii) Shellby tube 51mm OD 49mm ID
Which one you recommended to be used for getting good qualifier samples? (06 Marks)

OR

- 2 a. List the methods of dewatering technique used in the field and explain vacuum method. (06 Marks)
b. List and explain different types of samples of soil. (06 Marks)
c. Estimate the position of ground water table with following data by Hvorselve's method.
Depth upto which water is bailed out = 10.5m.
Water rise in 1st day = 0.63m
2nd day = 0.57
3rd day = 0.51m (08 Marks)

Module-2

- 3 a. Distinguish between Boussinesq's theory with Westergaurd's theory of stress distribution. (06 Marks)
b. Explain contact pressure distribution of soil. (06 Marks)
c. A circular area 6m in diameter carries uniformly distributed load of 10kN/m². Determine the vertical stress at a depth of 2m, 4m, and 8m. Plot the variation of vertical stress with depth. (08 Marks)

OR

- 4 a. Explain :
i) Pressure bulb
ii) Pressure distribution on Horizontal plane
iii) Pressure distribution on vertical plane. (06 Marks)
b. What are the different types of settlements? Explain. (06 Marks)
c. A Normally consolidated clay layer is 18m thick. Natural water content is 45%, saturated unit weight is 18kN/m³ specific gravity is 2.7 and liquid limit is 63%. The vertical stress increment at centre of clay layer due to foundation load is 9kPA. Ground water table is at the surface. Determine the settlement. (08 Marks)

Module-3

- 5 a. With a neat sketches, explain types of earth pressure. (06 Marks)
b. Describe Rebhann's graphical method of determining the active earth pressure on retaining wall. (08 Marks)

- c. A Retaining wall 7.5m high retains cohesionless, horizontal backfill. The top 3m of fill has a unit weight of 18kN/m^3 and $\phi = 30^\circ$ and the rest has a unit weight of 24kN/m^3 and $\phi = 20^\circ$. Determine using Rankine's theory, the distribution of active earth pressure and total active earth thrust. (06 Marks)

OR

- 6 a. With neat sketches, explain different types of slope failures. (06 Marks)
 b. Explain Swedish circle method of stability analysis of slopes for $C - \phi$ soils. (06 Marks)
 c. An embankment is to be constructed with $C = 20\text{kN/m}^2$, $\phi = 20^\circ$, $\gamma = 18\text{kN/m}^3$, F.S = 1.25 and height is 10m. Estimate side slope required. Taylor's stability numbers are as follows below table. Also find the factor of safety, if the slope is 1V: 2H given $\phi = 20^\circ$.

Slope angle	90	75	60	45	30	20	10
Sn	0.182	0.134	0.097	0.062	0.025	0.005	0

(08 Marks)

Module-4

- 7 a. Explain the types of shear failures with neat sketches. (06 Marks)
 b. With the help of neat sketches, explain the effect of water table and eccentric loading on bearing capacity of soil. (08 Marks)
 c. A square footing is to be constructed on a deep deposit of sand at a depth of 0.9m to carry a design load of 300kN with a factor of safety of 2.5. The ground water table may rise to the ground level during rainy season. Design the plan dimension of footing given $\gamma_{\text{sat}} = 20.8\text{ kN/m}^3$, $N_c = 25$, $N_q = 34$ and $N_\gamma = 32$. (06 Marks)

OR

- 8 a. List the assumptions and limitation made in Terzaghi's analysis. (06 Marks)
 b. With neat sketch, explain plate load test. (06 Marks)
 c. A square footing $2.8 \times 2.8\text{m}$ is built on a homogeneous bed of sand of density 18kN/m^3 and $\phi = 36^\circ$. If depth of foundation is 1.8m. Determine the safe load on footing. Take $F = 2.5$, $N_c = 27$, $N_q = 36$, $N_\gamma = 35$. (08 Marks)

Module-5

- 9 a. Explain the classification of piles based on the material and function. (08 Marks)
 b. Mention the situations where the pile foundation is necessary. (04 Marks)
 c. In a group of 16 pile diameter is 450mm and center to center 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 adhesion factor as 2 and Factor of safety 2.5. Also find safe allowable load. (08 Marks)

OR

- 10 Write a short notes on :
 i) Group capacity of piles (05 Marks)
 ii) Negative skin friction (05 Marks)
 iii) Under reamed piles (05 Marks)
 iv) Settlement of piles. (05 Marks)

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CBCS SCHEME

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18CV63

Sixth Semester B.E. Degree Examination, July/August 2022 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. Discuss the various processes involved in 'Hydrologic Cycle' using Horton's Engineering representation. (10 Marks)
- b. List the importance of hydrology with emphasis on global water availability. (10 Marks)

OR

- 2 a. Define Rain gauge. Describe with a neat sketch, the principle of working of Symon's non-recording gauge and its demerits. (06 Marks)
- b. What is Precipitation? Distinguish between Convection and Orographic precipitation. (07 Marks)
- c. Determine the optimum number of raingauges in a catchment area using the following data :
- Number of existing rain gauges = 08.
 - Mean annual rainfall at the gauges : 1000, 950, 900, 850, 800, 700, 600 and 400mm.
 - Permissible error = 6%. (07 Marks)

Module-2

- 3 a. What is meant by 'Evaporation Losses'? Discuss the factors affecting evaporation. (08 Marks)
- b. Define 'Evapotranspiration'. Explain in brief the 'Lysimeter method' of estimating the same in the field. (06 Marks)
- c. What is the Evaporation, if 4.80 litres of water is removed from an evaporation pan of diameter 1.22m and the simultaneous rainfall measurement is 9.0mm? (06 Marks)

OR

- 4 a. Discuss the factors that affect infiltration. Explain with a neat sketch, measurement of infiltration using double ring infiltrometer. (10 Marks)
- b. A 6 hour storm produced rainfall intensities of 7, 18, 25, 12, 10 and 3mm/hour in successive one hour intervals over a basin of 800km². The resulting run-off is observed to be $264 \times 10^5 \text{ m}^3$. Determine ϕ - index for the basin. (10 Marks)

Module-3

- 5 a. Define the following :
- Basin recharge
 - Direct run off
 - Drainage density
 - Form factor
 - Overland flow. (10 Marks)
- b. What is Runoff? List and explain factors affecting it. (10 Marks)

OR

- 6 a. How the hydrograph is affected by the following :
- Shape of the basin
 - Non-uniform aerial distribution of rainfall. (06 Marks)
- b. Define 'Unit hydrograph'. With the help of neat sketch, explain the various components of a flood hydrograph. (06 Marks)

- c. Given the ordinates of a 4 – hour unit hydrograph. Derive the ordinates of 12 – hour unit hydrograph for the same catchment. What is the peak value of discharge and the corresponding time interval observed in 4-h and 12-h unit hydrograph. **(08 Marks)**

Time (Hours)	0	4	8	12	16	20	24	28	32	36	40	44
Ordinates of 4-h UH cm^3/sec	0	20	80	130	150	130	90	52	27	15	05	0

Module-4

- 7 a. Define Irrigation. Discuss in brief the benefits and ill – effects of irrigation. **(08 Marks)**
 b. Distinguish between : Direct Irrigation and Storage Irrigation. **(06 Marks)**
 c. What is Bhandara Irrigation? List its advantages and disadvantages. **(06 Marks)**

OR

- 8 a. Define Duty and Delta. Derive the relation between them. **(06 Marks)**
 b. Define the following :
 i) Permanent wilting point ii) Field capacity. **(06 Marks)**
 c. After how many days water supply is required to ensure good yield, if :
 Field capacity of soil = 30% ; Permanent wilting point = 12% ;
 Density of soil = 1.4g/cc ; Effective depth of root zone = 80cm ;
 Daily consumptive use = 15mm. Readily available moisture is 85% of available moisture. **(08 Marks)**

Module-5

- 9 a. Write an explanatory note on Canal classification on the basis of its alignment. **(06 Marks)**
 b. Enumerate the basic differences between Lacey's and Kennedy's theory. **(06 Marks)**
 c. A channel section is to be designed for the following data :
 Discharge $Q = 5$ cumecs ; Silt factor = 1.0 ; Side slope = 0.5H = 1V.
 Also determine bed slope of the channel. Use Lacey's theory. **(08 Marks)**

OR

- 10 a. With a neat sketch, explain different zones of a storage reservoir. **(10 Marks)**
 b. With a neat sketch, explain step – by – step procedure of determining reservoir capacity for a specific yield using the mass – inflow curve. **(10 Marks)**

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Sixth Semester B.E. Degree Examination, July/August 2022 Solid Waste Management

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define Solid Waste? Explain the classification and sources of solid wastes. (10 Marks)
 b. Estimate the overall moisture content of a sample as collected residential MSW with the typical composition given in detail.

Components organic	Percent by weight	Moisture content %
Food waste	9	70
Paper	34	6
Cardboard	6	5
Plastics	7	2
Textiles	2	10
Rubber	0.5	2
Leather	0.5	10
Yard waste	18.5	60
Wood	2	20
Misc. organics	-	
Inorganic		
Glass	8	2
Tin can	6	3
Aluminum	0.5	2
other metal	3	3
Dirt.ash etc.,	3	8

(10 Marks)

OR

- 2 a. With neat sketch, explain hauled container system and stationary container system. (10 Marks)
 b. What is transfer station, explain the factors to be considered in the design of transfer station. (10 Marks)

Module-2

- 3 a. Explain the following :
 i) Mechanical volume reduction (Any one) (10 Marks)
 ii) Mechanical size reduction (Any one). (10 Marks)
 b. List and explain the various factors considered during selection of processing techniques. (10 Marks)

OR

- 4 Explain the different methods of component separation in municipal solid waste management (Any four) (20 Marks)

Module-3

- 5 a. What is composting? Differentiate between aerobic and anaerobic composting. (10 Marks)
 b. Explain :
 i) Vermi composting
 ii) Mechanical Compositing. (10 Marks)

OR

- 6 a. With an neat sketch explain the different method of sanitary landfill. (14 Marks)
 b. Determine landfill area required for a municipality with a population 50000, given that
 i) Solid waste generation = 350gms/person/day
 ii) Compacted density of landfill = 504Kg/m³
 iii) Average depth of compacted solid waste = 3m (06 Marks)

Module-4

- 7 a. Explain sources and disposal methods of Bio medical waste. (10 Marks)
 b. Explain the sources and recycling of E – waste. (10 Marks)

OR

- 8 Explain the sources, treatment and disposal of construction and demolition waste. (20 Marks)

Module-5

- 9 a. Explain the concept of 3T's factors affecting incineration. (10 Marks)
 b. With neat sketch, explain the working principle of municipal incinerator. (10 Marks)

OR

- 10 a. What is Pyrolysis, with neat flow diagram, explain the process of pyrolysis. (10 Marks)
 b. Explain the different energy recovery techniques in solid waste management. (10 Marks)

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GBCS SCHEME

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18CV651

Sixth Semester B.E. Degree Examination, July/August 2022 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. Write a note on basic concept of remote sensing. (04 Marks)
b. Explain the energy interaction with earth surface features with the help of a neat sketch. (10 Marks)
c. List the advantages and limitations of remote sensing. (06 Marks)

OR

- 2 a. Explain the remote sensing process with the help of a neat sketch. (10 Marks)
b. Write a note on false color composite. (04 Marks)
c. Describe visual interpretation technique with the help of interpretation key element. (06 Marks)

Module-2

- 3 a. Define remote sensing platform and mention its characteristics. (06 Marks)
b. Write the characteristics of Landsat, SPOT and cartosat satellite. (06 Marks)
c. Describe all type of sensor resolutions. (08 Marks)

OR

- 4 a. Explain image rectification and image enhancement. (10 Marks)
b. Explain briefly platforms and sensors in remote sensing. (10 Marks)

Module-3

- 5 a. Define GIS. Explain the components of GIS with a neat sketch. (10 Marks)
b. Describe the data types used in GIS models. (10 Marks)

OR

- 6 a. Explain different geographic coordinate system used in GIS. (10 Marks)
b. Explain various map projections used in GIS. (10 Marks)

Module-4

- 7 a. Explain vector data model and mention its advantages. (10 Marks)
b. List and explain different types of raster data models. (10 Marks)

OR

- 8 a. Explain the importance of topology in GIS. (10 Marks)
b. Explain the advantages and disadvantages of raster data in GIS. (10 Marks)

Module-5

- 9 a. Explain the application of RS and GIS in land use land cover analysis. (10 Marks)
b. Explain the role of remote sensing in water resources. (10 Marks)

OR

- 10 a. Explain the role of remote sensing and GIS in urban planning. (10 Marks)
b. Explain the role of remote sensing and GIS in traffic management. (10 Marks)

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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.

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Seventh Semester B.E. Degree Examination, July/August 2022 Design of RCC & Steel Structures

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any TWO full questions, choosing ONE full question from each module.
2. Use of IS456, IS-800, SP(6) and steel tables are permitted.

Module-1

- 1 Design a combined footing slab beam type for two RCC column A and B separated by a distance of 4 m C/C. Column A is 500×500 mm and carries a load of 1250 kN and column B is 600×600 mm and carries a load of 1600 kN. Take SBC of soil is 200 kN/m^2 . Use M20 concrete and Fe415 steel. Draw the sectional elevation. (50 Marks)

OR

- 2 Design a Cantilever retaining wall to retain earth embankment 5 m high above ground level. The density of earth is 18 kN/m^3 and its angle of repose is 30° . The embankment is horizontal at its top. The SBC of soil may be taken as 200 kN/m^2 and the co-efficient of friction between soil and concrete is 0.5. Adopt M20 grade concrete and Fe415 steel. Also draw cross sectional elevation showing reinforcement details. (50 Marks)

Module-2

- 3 A line diagram of a roof truss with internal loads and forces in each member are shown in Fig. Q3. Design the various members of the roof truss along with their end connection with bolt of property class 5.6. Also design the bearing plate at support for the reaction and anchor bolts for an uplift force of 15 kN. Also draw the Elevation of truss greater than half plan.

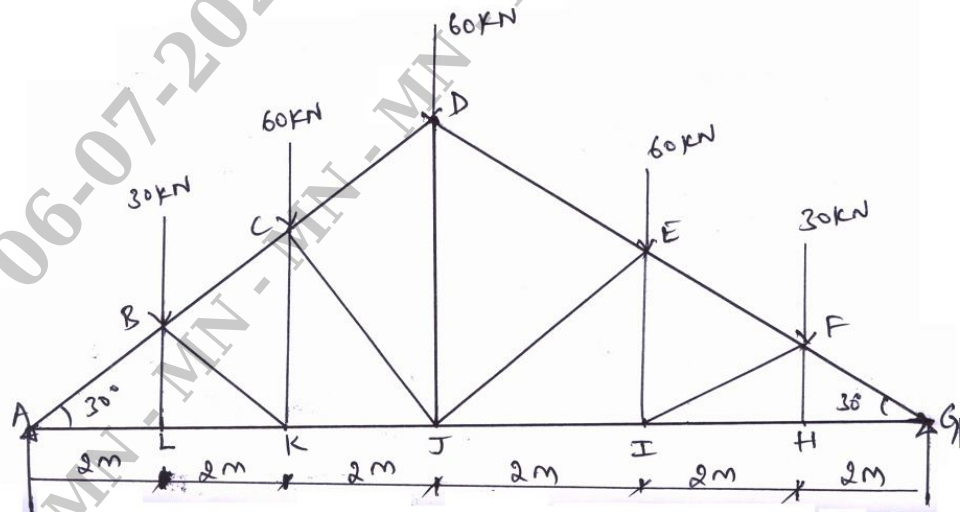


Fig. Q3
1 of 2

Members	Length (m)	Force (kN)	Nature of force
AB, GF	2.31	240	C
BC, FE	2.31	210	C
CD, ED	2.31	160.04	C
AL, GH	2.0	207.84	T
LK, HI	2.0	207.84	T
KJ, IJ	2.0	181.82	T
BL, FH	1.154	0	-
BK, FI	2.31	30	C
CK, EI	2.31	15	T
CJ, EJ	3.05	66	C
DJ	3.46	60	C

(50 Marks)

OR

- 4 Design a simply supported gantry girder to carry an electrically operated crane with the following data:

Span of Crane bridge = 25 m

Span of gantry girder = 8 m

Wheel base = 3.5 m

Crane capacity = 200 kN

Weight of crane bridge = 150 kN

Weight of trolley = 75 kN

Min Hook distance = 1.0 m

Weight of rail = 0.30 kN/m

Height of rail = 105 mm

Draw the sectional elevation.

(50 Marks)

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CBCS SCHEME

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18CV81

Eighth Semester B.E. Degree Examination, July/August 2022 Design of Prestressed Concrete

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Distinguish between pre tensioning and post tensioning. (06 Marks)
- b. List the advantages of PSC over RCC. (04 Marks)
- c. Explain with sketch Hoyer's long line systems of pre-tensioning. (10 Marks)

OR

- 2 a. Explain concept of Thrust line. (06 Marks)
- b. A rectangular concrete beam of cross section 300mm deep and 200mm wide is prestressed by means of 15 wires of 5mm diameter located 65mm from the bottom of beam and 3 wires of 5mm diameter, 25mm from top. Assuming the prestress in steel as 840N/mm^2 , calculate the stresses at the extreme fibres of mid span section. When the beam is supporting its own weight over a span of 6m. If a uniformly distributed live load of 6kN/m is imposed, evaluate the maximum working stress in concrete. (14 Marks)

Module-2

- 3 a. List different types of losses in post tensioning system. Explain any two. (06 Marks)
- b. A pretensioned beam, 200mm wide and 300mm deep is prestressed by 10 wires, of 7mm diameter initially stressed to 1200N/mm^2 , with their centroids located 10mm 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 5% of steel stress, estimate the final percentage loss of stress in the wires using the Indian Standard Code regulations and following data:
 $E_s = 210\text{kN/mm}^2$, $E_c = 5000\sqrt{f_{cu}}$, $f_{cu} = 42\text{ N/mm}^2$ creep co-efficient (ϕ) = 1.6,
total residual shrinkage strain = 3×10^{-4} . (14 Marks)

OR

- 4 a. Explain:
 - i) Short term deflection
 - ii) Long term deflection
 - iii) Limiting deflection as per IS code. (06 Marks)
- b. A type-3 post tensioned pre stressed concrete beam of 10m span. The beam is post tensioned using three high tensile bars of 40mm diameter located @ an effective depth of 700mm. The effective cover from each of the vertical face of the beam is 60mm. the effective pre stressing force in each bar after all losses is 600kN. Given, cross section $450\text{mm} \times 750\text{mm}$, $\frac{x}{d} = 0.43$,
 $\frac{I_c}{b_d^3} = 0.081$, $f_p = 1035\text{N/mm}^2$, $E_s = 200\text{kN/mm}^2$, $E_c = 28\text{kN/mm}^2$, compute the width of cracks in the tension zone if the service load moment at mid span is 1040kN-m. (14 Marks)

Module-3

- 5 a. Explain failure modes of beam under flexure. (06 Marks)
 b. A post tensioned bridge girder with unbonded 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 4000mm² and is located at an effective depth of 1600mm. The effective prestress in steel after all losses is 1000N/mm² and the effective span of 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 section. (14 Marks)

OR

- 6 Design a simply supported Type-1 pre stressed beam with total moment $M_T = 435\text{kN-m}$ including self weight moment of $M_{sw} = 55\text{kN-m}$. The height of the beam is restricted to 920mm. The pre stress at transfer $f_{po} = 1035\text{N/mm}^2$ and pre stress at service $f_{pe} = 860\text{N/mm}^2$. The allowable compressive stresses are 12.5N/mm^2 at transfer and 11.0N/mm^2 at service. The pre-stressing tendon is 7 wire strand with nominal diameter of 12.8mm and nominal area of 99.3N/mm^2 . (20 Marks)

Module-4

- 7 a. Explain different methods of improving shear resistance of PSC members. (05 Marks)
 b. Explain the mechanism of shear failure in PSC beams. (05 Marks)
 c. The support section of a PSC beam 150×300 is to resist a shear of 100kN. The pre stress at centroidal axis is 5N/mm^2 , and $f_{ck} = 40\text{N/mm}^2$. The cover to tension reinforcement is 45mm. Check the section for shear and design suitable shear reinforcement using IS Code recommendation. (10 Marks)

OR

- 8 a. Differentiate between web shear and flexure shear cracks in PSC members with neat sketches. (06 Marks)
 b. A pre stressed I section has the following properties. Area = $55 \times 10^3\text{mm}^2$, $I = 189 \times 10^7\text{mm}^4$, statical moment about the centroid = $468 \times 10^4\text{mm}^3$, thickness of web = 50mm. It is prestressed horizontally by 24 wires of 5mm diameter and vertically by similar wires at 150mm centres. All the wires carry a tensile stress of 900N/mm^2 . Calculate the principal stress at the centroid when shearing force of 80kN acts upon this section. (14 Marks)

Module-5

- 9 a. Write a note on anchorage zone stresses. (04 Marks)
 b. Explain end zone reinforcement. (06 Marks)
 c. The end block of a post-tensioned prestressed concrete beam, 300mm wide and 300mm deep, is subjected to a concentric anchorage force of 832.8kN by a Freyssinet anchorage of area 11720mm^2 . Design and detail the anchorage reinforcement for the end block. (10 Marks)

OR

- 10 a. Explain with neat sketches the following pre-stressing systems:
 i) Freyssinet's system ii) BBRV system. (10 Marks)
 b. The end block of a post-tensioned bridge girder is 600mm wide by 1200mm deep. Two cables, each comprising 97 high tensile wires of 7mm diameter, are anchored using square anchor plates of side length 410mm with their centres located at 600mm from the top and bottom edges of beam. The jacking force in each cable is 4500kN. Design a suitable anchorage zone reinforcement using Fe-415 grade HYSD bars conforming to IS:1343 code provisions. (10 Marks)

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CBCS SCHEME

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18CV824

Eighth Semester B.E. Degree Examination, July/August 2022 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. Explain how Freeze and Thaw on concrete causes deterioration of concrete structures. (10 Marks)
- b. Explain the following terms : (10 Marks)
- (i) Repair. (ii) Maintenance. (iii) Rehabilitation.
- (iv) Retrofitting. (v) Strengthening.

OR

- 2 a. Write short notes on Durability of concrete and Acid attack. (08 Marks)
- b. Explain the evaluation of structural damages to the concrete structural elements due to earthquake. (12 Marks)

Module-2

- 3 a. Explain the step by step Damage Assessment Procedure. (08 Marks)
- b. What is destructive testing systems? Why load tests are usually carried? (04 Marks)
- c. Explain the penetration technique. (08 Marks)

OR

- 4 a. Write the objectives of rapid structured assessment. Explain the rapid assessment procedure. (12 Marks)
- b. List the common methods used in construction industry for semi-destructive testing systems. (08 Marks)

Module-3

- 5 a. Explain the effects due to climate and temperature. (08 Marks)
- b. Explain the cathode protection. (06 Marks)
- c. What are the effects due to corrosion? Write the Anode and Cathode reactions. (06 Marks)

OR

- 6 a. Explain the corrosion Inhibitors. (08 Marks)
- b. Explain the design and construction errors of concrete structures. (12 Marks)

Module-4

- 7 a. Discuss the importance of maintenance of structures. (08 Marks)
- b. Explain Beam Jacketing Technique, with sketches. (12 Marks)

OR

- 8 a. Explain externally bonding technique. (12 Marks)
- b. What is the process involved in near surface mounted technique. (08 Marks)

Module-5

- 9 a. What is carbon fibre reinforced polymer? (06 Marks)
- b. Explain the types of special mortars. (10 Marks)
- c. What are the properties of Epoxy resins? (04 Marks)

OR

- 10 a. What is Sisal Fibre and write its properties? (08 Marks)
- b. What is shoring and under Pinning? Explain its types. (12 Marks)

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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.