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VTU Question Papers

Civil engineering-III,V,VI & VII Semester

Feb/Mar-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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Third Semester B.E. Degree Examination, Feb./Mar. 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. Evaluate (i) $L\left\{\dfrac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L(t^2 e^{-3t} \sin 2t)$ **(06 Marks)**

b. If $f(t) = \begin{cases} t, & 0 \le t \le a \\ 2a - t, & a \le t \le 2a \end{cases}$, $f(t + 2a) = f(t)$ then show that $L(f(t)) = \dfrac{1}{s^2}\tanh\left(\dfrac{as}{2}\right)$ **(07 Marks)**

c. Solve by using Laplace Transforms
$\dfrac{d^2 y}{dt^2} + 4\dfrac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ **(07 Marks)**

OR

2 a. Evaluate $L^{-1}\left(\dfrac{4s + 5}{(s+1)^2(s+2)}\right)$ **(06 Marks)**

b. Find $L^{-1}\left(\dfrac{s}{(s^2 + a^2)^2}\right)$ by using convolution theorem. **(07 Marks)**

c. Express $f(t) = \begin{cases} \sin t, & 0 \le t < \pi \\ \sin 2t, & \pi \le t < 2\pi \\ \sin 3t, & t \ge 2\pi \end{cases}$

in terms of unit step function and hence find its Laplace Transform. **(07 Marks)**

Module-2

3 a. Obtain fourier series for the function $f(x) = |x|$ in $(-\pi, \pi)$ **(06 Marks)**

b. Expand $f(x) = \dfrac{(\pi - x)^2}{4}$ as a Fourier series in the interval $(0, 2\pi)$ and hence deduce that

$\dfrac{\pi^2}{12} = \dfrac{1}{1^2} - \dfrac{1}{2^2} + \dfrac{1}{3^2} - \dfrac{1}{4^2} + \ldots\ldots\ldots$ **(07 Marks)**

c. Express y as a Fourier series upto the second harmonic given :

x:	0	60	120	180	240	300
y:	4	3	2	4	5	6

(07 Marks)

OR

4 a. Find the Half-Range sine series of $\pi x - x^2$ in the interval $(0, \pi)$ **(06 Marks)**

b. Obtain fourier expansion of the function $f(x) = 2x - x^2$ in the interval $(0, 3)$. **(07 Marks)**

c. Obtain the Fourier expansion of y upto the first harmonic given :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

Module-3

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

value of $\int\limits_{0}^{\infty} \dfrac{\sin x}{x} dx$ **(06 Marks)**

b. Find the infinite Fourier cosine transform of $e^{-\alpha x}$. **(07 Marks)**

c. Solve using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0$, $y_1 = 2$ **(07 Marks)**

OR

6 a. Find the fourier sine transform of $f(x) = e^{-|x|}$ and

hence evaluate $\int\limits_{0}^{\infty} \dfrac{x \sin mx}{1 + x^2} dx$; $m > 0$. **(06 Marks)**

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

c. Find the inverse z-transform of

$\dfrac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$ **(07 Marks)**

Module-4

7 a. Solve $\dfrac{dy}{dx} = x^3 + y$, $y(1) = 1$ using Taylor's series method considering up to fourth degree

terms and find y(1.1). **(06 Marks)**

b. Given $\dfrac{dy}{dx} = 3x + \dfrac{y}{2}$, $y(0) = 1$ compute y(0.2) by taking h = 0.2 using Runge – Kutta

method of fourth order. **(07 Marks)**

c. If $\dfrac{dy}{dx} = 2e^x - y$, $y(0) = 2$, $y(0.1) = 2.010$, $y(0.2) = 2.040$ and $y(0.3) = 2.090$, find y(0.4)

correct to 4 decimal places using Adams-Bashforth method. **(07 Marks)**

OR

8 a. Use fourth order Runge-Kutta method, to find y(0.8) with h = 0.4, given $\dfrac{dy}{dx} = \sqrt{x + y}$,

y(0.4) = 0.41 **(06 Marks)**

b. Use modified Euler's method to compute y(20.2) and y(20.4) given that $\dfrac{dy}{dx} = \log_{10}\left(\dfrac{x}{y}\right)$ with

y(20) = 5 Taking h = 0.2. **(07 Marks)**

c. Apply Milne's predictor-corrector formulae to compute y(2.0) given $\dfrac{dy}{dx} = \dfrac{x + y}{2}$ with

x	0.0	0.5	1.0	1.5
y	2.000	2.6360	3.5950	4.9680

(07 Marks)

Module-5

9 a. Using Runge-Kutta method, solve

$$\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$$, for x = 0.2, correct to four decimal places, using initial conditions

y(0) = 1, y'(0) = 0 **(07 Marks)**

b. Derive Euler's equation in the standard form viz, $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$ **(07 Marks)**

c. Find the extremal of the functional $\int_{x_1}^{x_2}(y^2 + y'^2 + 2ye^x)\,dx$ **(06 Marks)**

OR

10 a. Given the differential equation $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}$ and the following table of initial values:

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y'	2	2.3178	2.6725	2.0657

Compute y(1.4) by applying Milne's Predictor-corrector formula. **(07 Marks)**

b. Prove that geodesics of a plane surface are straight lines. **(07 Marks)**

c. On what curves can the functional $\int_0^1(y'^2 + 12xy)\,dx$ with y(0) = 0, y(1) = 1 can be extremized? **(06 Marks)**

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Third Semester B.E. Degree Examination, Feb./Mar. 2022
Additional Mathematics – I

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 modulus and amplitude of the complex number : $\dfrac{(2-3i)(2+i)^2}{1+i}$. **(07 Marks)**

　b. Prove that $\left(\dfrac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. **(06 Marks)**

　c. Show that the vectors $\vec{a}-2\vec{b}+3\vec{c}$, $-2\vec{a}+3\vec{b}-4\vec{c}$, $-\vec{b}+2\vec{c}$ are coplanar. **(07 Marks)**

OR

2　a. Given $\vec{a}=2\hat{i}+2\hat{j}-\hat{k}$, $\vec{b}=6\hat{i}-3\hat{j}+2\hat{k}$. Find : i) $\vec{a}\cdot\vec{b}$　ii) $\vec{a}\times\vec{b}$　iii) $|\vec{a}\times\vec{b}|$. **(07 Marks)**

　b. Determine the value of λ, so that $\vec{a}=2\hat{i}+\lambda\hat{j}-\hat{k}$, and $\vec{b}=4\hat{i}-2\hat{j}-2\hat{k}$, are perpendicular. **(06 Marks)**

　c. Express $1-i\sqrt{3}$ in the polar form and hence find its modulus and amplitude. **(07 Marks)**

Module-2

3　a. Using Euler's theorem, prove that $xu_x + yu_y = -3\cot u$ where $u = \sin^{-1}\left(\dfrac{x^2 y^2}{x+y}\right)$. **(07 Marks)**

　b. Using Maclaurin's series, prove that $\sqrt{1+\sin 2x} = 1 + x - \dfrac{x^2}{2} - \dfrac{x^3}{3} + \dfrac{x^4}{24} + ...$. **(06 Marks)**

　c. If $u = x + 3y^2$, $v = 4x^2 yz$, $w = 2z^2 - xy$, evaluate $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$ at the point $(1, -1, 0)$. **(07 Marks)**

OR

4　a. Obtain Maclaurin's series expansion for the function e^x upto x^4. **(07 Marks)**

　b. If $u = \sin^{-1}\left[\dfrac{x^3+y^3}{x+y}\right]$ prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 2\tan u$. **(06 Marks)**

　c. If $u = f\left(\dfrac{x}{y}, \dfrac{y}{z}, \dfrac{z}{x}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

Module-3

5　a. A particle moves along the curve $x = (1 - t^3)$, $y = (1 + t^2)$, $z = (2t - 5)$ determine its velocity and acceleration at $t = 1$ sec. **(07 Marks)**

　b. If $\vec{F} = 2x^2\hat{i} - 3yz\hat{j} + xz^2\hat{k}$, and $\phi = 2z - x^3 y$, find $\vec{F}\cdot(\nabla\phi)$ and $\vec{F}\times(\nabla\phi)$ at $(1, -1, 1)$. **(06 Marks)**

　c. Find the constants a, b, c so that $\vec{f} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ is irrotational. **(07 Marks)**

OR

6 a. Find the directional derivate of $\phi = x^2yz + 4xz^2$ at $(1,-2,-1)$ along $\vec{a} = 2\hat{i} - \hat{j} - 2\hat{k}$ **(07 Marks)**

b. Find curl $\vec{f}$ given that $\vec{f} = xyz^2\hat{i} + xy^2z\hat{j} + x^2yz\hat{k}$. **(06 Marks)**

c. If $\vec{f} = x^2i + y^2j + z^2k$ and $\vec{g} = yzi + zxj + xyk$. Show that $\vec{f} \times \vec{g}$ is a solenoidal vector. **(07 Marks)**

Module-4

7 a. Obtain the reduction formula, $I_n = \int \cos^n x\,dx$, where n is a positive integer. **(07 Marks)**

b. Evaluate $\int\limits_{0}^{1}\int\limits_{x}^{\sqrt{x}} xy\,dy\,dx$. **(06 Marks)**

c. Evaluate $\int\limits_{0}^{1}\int\limits_{0}^{1}\int\limits_{0}^{1}(x+y+z)dx\,dy\,dz$. **(07 Marks)**

OR

8 a. Evaluate : $\int\limits_{0}^{\pi/6}\sin^6(3x)dx$. **(07 Marks)**

b. Evaluate : $\int\limits_{0}^{\pi} x\sin^4 x\cos^6 x\,dx$. **(06 Marks)**

c. Evaluate $\int\limits_{0}^{1}\int\limits_{0}^{1}\int\limits_{0}^{y} xyz\,dx\,dy\,dz$. **(07 Marks)**

Module-5

9 a. Solve : $(2x + y + 1)\,dx + (x + 2y + 1)\,dy = 0$. **(07 Marks)**
b. Solve : $(4xy + 3y^2 - x)\,dx + (x^2 + 2xy)\,dy = 0$. **(06 Marks)**
c. Solve : $y(2xy + e^x)\,dx - e^x\,dy = 0$. **(07 Marks)**

OR

10 a. Solve : $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$. **(07 Marks)**
b. Solve : $y(2xy + 1)dx - x\,dy = 0$. **(06 Marks)**
c. Solve : $\dfrac{dy}{dx} + y\cot x = \cos x$. **(07 Marks)**

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18CV32

Third Semester B.E. Degree Examination, Feb./Mar. 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. Derive the expression for extension of rectangular tapering bar subjected to an axial load P.
    (07 Marks)

    b. Explain the terms :
       (i) Modulus of Elasticity   (ii) Modulus of Rigidity   (iii) Poisson's Ratio.   **(03 Marks)**

    c. A round bar with stepped portion is subjected to the forces as shown in Fig.Q1(c).
       Determine the magnitude of force P, such that the net deformation in the bar does not exceed
       1 mm. E for steel is 200 GPa, E for Aluminium is 70 GPa. Large end diameter and small end
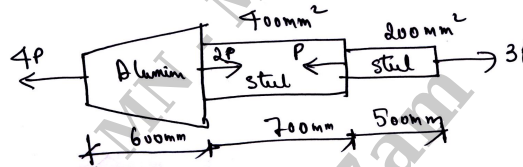   diameter of the tapering bar are 40mm and 12.5mm respectively.

Fig.Q1(c)   **(10 Marks)**

OR

2   a. Explain the St. Venant's Principle.   **(04 Marks)**

    b. A steel sleeve is slipped over a brass bolt and held in place by a nut. Compute the
       temperature rise required to stress the brass to 27.5 N/mm^2 in compression. Use the
       following data: $A_s = 500mm^2$, $A_b = 480\ mm^2$, $E_s = 19.6 \times 10^4\ N/mm^2$, $E_b = 8.82 \times 10^4\ N/mm^2$
       $\alpha_s = 12 \times 10^{-6}$ cm/cm/°C, $\alpha_b = 19 \times 10^{-6}$ cm/cm/°C.   **(08 Marks)**

    c. Derive the relationship between the 3 elastic constants E, G, K.   **(08 Marks)**

Module-2

3   a. Show that the planes of maximum shear stresses are inclined at 45° with the principal
       planes.   **(06 Marks)**

    b. The state of stress in a two-dimensionally stressed body is shown in Fig.Q3(b). Determine
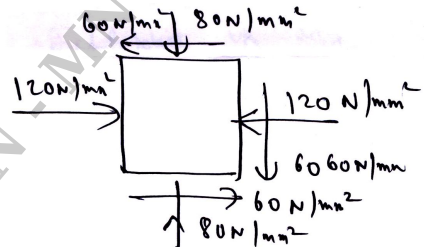   the principal planes, principal stresses, maximum shear stress and their planes.

Fig.Q3(b)   **(14 Marks)**

OR

4   a. Derive Lame's equation for radial and hoop stresses for thick cylinder subjected to internal
       and external fluid pressures.   **(08 Marks)**

b. A thick cylindrical vessel is 250 mm in internal diameter and has 50mm thick walls. It is subjected to an internal pressure of 10 MPa due to the movement of fluid. Find the maximum hoop stress developed. Also calculate the radial and hoop stress at a point 20mm from the inside surface. **(08 Marks)**

c. A thin cylinder is 3m in length, 1m in diameter and has a metal thickness of 12mm in its walls. Determine the stresses (Hoop and Longitudinal) and strain along the length when subjected to an internal pressure of 1.5 MPa. Take E = 210 GPa, $\mu = 0.25$. **(04 Marks)**

Module-3

5 a. For a cantilever beam subjected to a UDL of intensity W/unit length throughout, plot the SFD and BMD. **(06 Marks)**

b. For the beam shown in Fig.Q5(b) construct the SFD and BMD indicating salient values. Find the point of contraflexure, if any.
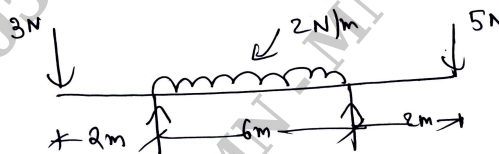

Fig.Q5(b) **(14 Marks)**

OR

6 a. For a simply supported beam subjected to uniformly varying load of W/unit length plot the SFD and BMD. **(08 Marks)**

b. For the beam shown in Fig.Q6(b), find the load 'P' to have equal reactions at A and C. Draw the Binding Moment and Shear Force diagram indicating values at significant points. Locate the point of contraflexure. **(12 Marks)**
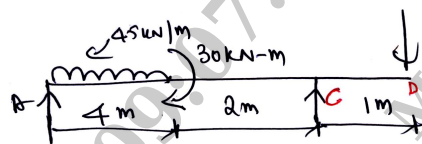

Fig.Q6(b)

Module-4

7 a. Define Section Modulus and Moment of Resistance. **(04 Marks)**

b. Derive the relationship between Bending Stresses and Radius of curvature

ie., $\dfrac{\sigma}{y} = \dfrac{E}{R}$ **(06 Marks)**

c. An unsymmetric I-section is subjected to a bending moment of 20 kN-m. The top flange being in compression. Draw the bending stress variation diagram across the section marking salient points and compute the total moment resisted by the top flange. Refer Fig.Q7(c).
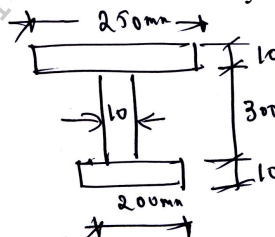

Fig.Q7(c) **(10 Marks)**

OR

8   a.   Compare the weight of solid shaft to that of the hollow shaft of the same material, having the same length to transmit power at a given speed. Take inside diameter of hollow shaft as 0.5 times the outer diameter. **(10 Marks)**

    c.   Determine the diameter of the solid shaft which will transmit 440 kW at 280 rpm, if the maximum torsional shear stress is to be limited to 40 N/mm^2. Assume G = 84 kN/mm^2 and length of shaft is 1m with angle of twist of 1 degree. **(10 Marks)**

Module-5

9   a.   For a simply supported beam subjected to an UDL of 'W' N/m determine the magnitude of maximum deflection using Double Integration method. **(10 Marks)**

    b.   An overhanging beam ABC is loaded as shown in Fig.Q9(b). Determine the slope and deflection at its free end C. Take E = 2×10^5 N/mm^2 and I = 5×10^8 mm^4.
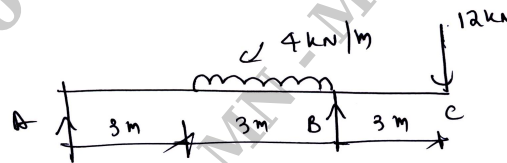
Fig.Q9(b) **(10 Marks)**

OR

10   a.   Derive the Euler's equation for buckling load on a column with one end fixed and other end hinged. **(10 Marks)**

    b.   A hollow cast iron column whose outside diameter is 200mm has a thickness of 20mm. It is 4.5m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a FOS of 4. Calculate ratio of Euler's and Rankine's critical loads for cast iron,

take $\alpha = \dfrac{1}{1600}$, $\sigma_c = 550$ N/mm^3, E = 8×10^4 N/mm^2. **(10 Marks)**

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Third Semester B.E. Degree Examination, Feb./Mar. 2022
Fluids Mechanics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define fluid. Distinguish between solids, liquids and gases. **(06 Marks)**

   b. Define capillarity. Obtain an expression for capillary rise or drop for a given liquid of specific weight 'r_L' and 'd' diameter of glass tube, angle of contact is 'θ', 'σ' represents the surface tension force

$$h = \frac{4\sigma\cos\theta}{r_L \cdot d}$$

   (06 Marks)

   c. A 90 N rectangular solid block slides down a 30° inclined plane. The plane is lubricated by a 3 mm thick film of oil of relative density 0.90 and viscosity 0.8 Ps-sec. If the contact area is 0.3 m², estimate the terminal velocity of block. **(08 Marks)**

OR

2 a. The pressure 3m below the free surface of a liquid is 13.72 kN/m². Determine its specific weight and relative density. **(06 Marks)**

   b. Explain gauge, absolute and vacuum pressure. How do you determine the absolute pressure from the gauge pressure? **(06 Marks)**

   c. Find out the differential reading 'h' of an inverted U-tube manometer containing oil of specific gravity 0.7. The manometric liquid when connected across pipes 'A' and 'B' is shown in Fig.Q2(c). Convey liquids of specific gravity 1.2 and 1.0 (water) which are immiscible with manometric liquid. Pipes 'A' and 'B' are located at the same level and assume the pressures at 'A' and 'B' are equal.
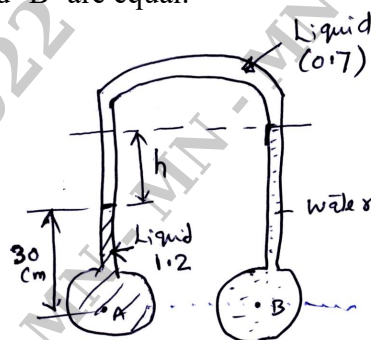
Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Define the following and mention their SI units:
   (i) Total Pressure   (ii) Centre of pressure   (iii) Total acceleration **(06 Marks)**

   b. An isosceles triangular plate of base 4m and altitude 4m is immersed vertically in fluid with a specific gravity 0.8. The base of the triangle is touching the top of the surface fluid horizontally and rest of its portion is within the fluid. Determine the total pressure and centre of pressure of the plate from the top liquid level. **(08 Marks)**

   c. Write short notes on: (i) Lagrangian method (ii) Eulerian method (iii) Flow net **(06 Marks)**

OR

4 a. A cylindrical gate is 3m long and has water on its both sides as shown in Fig.Q4(a). Determine the magnitude and direction of the resultant hydrostatic force exerted on the gate.

Fig.Q4(a) **(08 Marks)**

   b. Distinguish between:
   (i)   Steady flow and unsteady flow
   (ii) Rotational flow and irrotational flow **(04 Marks)**

   c. If $\phi = 3xy$, find x and y components of velocity at (1, 3) and (3, 3). Determine the discharge passing between streamlines passing through these points. **(08 Marks)**
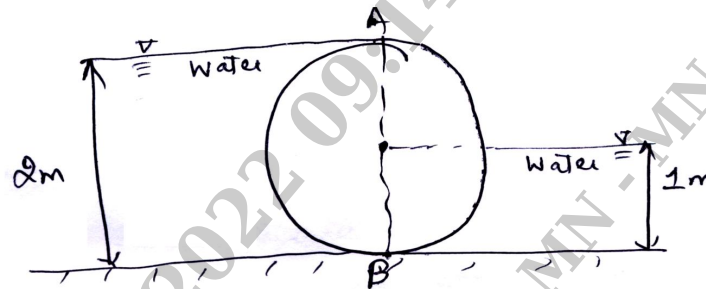
Module-3

5 a. State and prove Euler's equation of motion and derive Bernoulli's energy equation from it. Mention the assumptions. **(10 Marks)**

   b. For the horizontal venturimeter of 150 mm × 75 mm, determine the reading of the mercury manometer, if the pipe carries 40 LPS of water. Given $C_d = 0.97$. Sp.Gr. mercury = 13.6.

   (10 Marks)

OR

6 a. 300 LPS of water is flowing in a pipe having diameter of 300 mm. If the pipe is bent by 120°, find the magnitude and direction of the resultant force on the bend. The pressure of the water flowing is 400 kN/m^2. Take specific weight of water = 9.81 kN/m^3. **(08 Marks)**

   b. With a neat sketch, describe the construction and working of a pitot tube. **(06 Marks)**

   c. An orifice meter consists of 100 mm diameter in a 300 mm diameter pipe having a coefficient of discharge of 0.65. The pipe delivers oil of relative density 0.9. The pressure difference on the two sides of the orifice plate measured by mercury differential manometer is 70 cm. Find the rate of discharge in litres per second. **(06 Marks)**

Module-4

7 a. Distinguish between the following:
   (i)   Notch and weir
   (ii) Mouthpiece and orifice
   (iii) Broad crested weir and sharp crested weir
   (iv) Triangular notch and Cipolletti notch **(08 Marks)**

   b. Explain the classification of Notches and Weirs. **(06 Marks)**

   c. A discharge of 0.08 m^3/sec was measured over a 60° angled notch. While measuring the head over notch an error of 2 mm was made. Determine the percentage error in discharge if the coefficient of discharge for the notch is 0.6. **(06 Marks)**

OR

8 a. Oil flows through a 25 mm diameter orifice under a head of 5.5 m at a rate of 3 LPS. The jet strikes a wall 1.5 m away and 120 mm vertically below the centerline of the contracted jet. Calculate the coefficients of velocity, contraction and discharge. **(06 Marks)**

b. A trapezoidal notch has a base width of 0.75 m and a side slope of 1 horizontal to 2 vertical. Calculate the discharge over the notch for a head of 0.50 m by assuming $C_d = 0.63$.

(06 Marks)

c. Write a short note on ventilation of Weirs mentioning its type and effect on discharge measurement.

(08 Marks)

Module-5

9 a. Derive an expression for the loss of head due to sudden expansion in the pipe. **(08 Marks)**

b. Explain Hardy Cross method for pipe network analysis. **(06 Marks)**

c. A cast iron pipe ($E = 1.0 \times 10^{11}$ Pa) is a 0.9 m in diameter and carries water ($K = 2.0 \times 10^{9}$ Pa) at a velocity of 2.6 m/s. A valve in this pipe is instantaneously closed bringing the flow to a sudden stop at the valve end. Estimate the water hammer head produced due to this action. The pipe thickness is 1.25 cm and the pipe can be treated as elastic. **(06 Marks)**

OR

10 a. A 6 cm diameter pipe has a discharge of water of 450 Litres/minute. At a section the pipe has a sudden expansion to a size of 9 cm diameter. If the pressure just upstream of the expansion is 20 KN/m², calculate the pressure just after the expansion. Assume the pipe to be horizontal. Given $r_w = 9.81$ kN/m³. **(06 Marks)**

b. Explain the following terms with a neat sketch:
(i) Pipes in series   (ii) Total energy line
(iii) Water Hammer in pipes   (iv) Hydraulic gradient line **(08 Marks)**

c. The velocity of water in a 60 cm diameter and 1.5 cm thick cast iron pipe ($E = 1.04 \times 10^{11}$ Pa) is changed from 3 m/sec to zero in 0.8 sec by closure of a valve. What will be the corresponding pressure rise if given bulk modulus of elasticity of water is 2.11×10^{9} N/m². **(06 Marks)**

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18CV34

Third Semester B.E. Degree Examination, Feb./Mar. 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. What do you mean by Dressing of Stones? Explain types of dressing of stones. **(08 Marks)**
   b. Discuss the characteristics of good building stone. **(08 Marks)**
   c. Mention the qualities of good bricks. **(04 Marks)**

OR

2 a. Explain with neat sketch, the construction and working of a clamp, for burning of bricks. **(08 Marks)**
   b. Briefly discuss the advantages of cement concrete blocks. **(06 Marks)**
   c. Discuss the importance of size, shape and texture of coarse aggregates. **(06 Marks)**

Module-2

3 a. Define Foundation. Discuss functions and causes for the failure of foundation. **(08 Marks)**
   b. Explain different methods involved in site exploration for foundation. **(06 Marks)**
   c. With neat sketches discuss the features of Flemish bond and English bond of one and half thick brick wall. **(06 Marks)**

OR

4 a. Explain types of joints in stone masonry with neat sketches. **(08 Marks)**
   b. State the comparative merits and demerits of stone and brick masonry. **(06 Marks)**
   c. Describe method of construction and advantages of cavity and partition walls. **(06 Marks)**

Module-3

5 a. With neat sketches, explain various components of segmental arch. **(06 Marks)**
   b. Distinguish clearly between Lintel and an Arch. How does flat stone arch differs from a stone lintel? **(06 Marks)**
   c. Explain briefly the definition and functions of the Chejja, Balcony and Canopy. **(08 Marks)**

OR

6 a. Mention requirement of good floor, describe the method of constructing cement concrete flooring. **(08 Marks)**
   b. With the help of neat sketch, explain components of Queen Post Truss. **(06 Marks)**
   c. What are the factors to be considered while selecting roof covering? **(06 Marks)**

Module-4

7 a. Explain the following doors with neat sketches:
   (i)   Fully paneled door
   (ii) Revolving door **(06 Marks)**
   b. Discuss the following windows with neat sketches:
   (i) Bay window   (ii) Corner window
   (iii) Louvered window   (iv) Pivoted window **(08 Marks)**
   c. Describe briefly classification of stairs. **(06 Marks)**

OR

8 a. Plan a dog-legged stair for a building in which the vertical distance between the floor is 3.6 meter. The stair wall measure 2.5 × 5.0 meter.   **(08 Marks)**
   b. What are the types of Scaffolding commonly used?   **(08 Marks)**
   c. Write explanatory note on shoring and under pinning form work.   **(04 Marks)**

Module-5

9 a. Write the objectives of plastering and requirement of good plaster.   **(08 Marks)**
   b. Discuss the defects in plastering.   **(07 Marks)**
   c. Explain the method of applying stucco plastering.   **(05 Marks)**

OR

10 a. Discus the causes, effects and methods of controlling dampness in building.   **(08 Marks)**
   b. Mention the objectives of painting and point out the characteristics of an ideal paint.
                                                                                           (06 Marks)
   c. Describe the procedure of painting on wood surface and inner walls of residential building.
                                                                                           (06 Marks)

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18CV35

Third Semester B.E. Degree Examination, Feb./Mar.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. Explain the classification of survey. **(04 Marks)**
    b. Explain the basic principles of surveying with sketches. **(06 Marks)**
    c. What is conventional symbols? With neat sketches show any six conventional symbols used in surveying. **(10 Marks)**

OR

2   a. What is ranging? Explain indirect ranging with neat sketch. **(06 Marks)**
    b. With neat sketches, explain obstacles in chaining. **(08 Marks)**
    c. A steel tape 20 m long standardized at 55°F with a pull of 100 N was used for measuring base line. Find the correction per tape length, if the temperature at the time of measurement was 80°F and pull exerted was 160 N. Weight of 1 cubic cm of steel is 0.0786 N. Weight of tape is 8 N and $E = 2.1 \times 10^5$ N/mm^2. Co-efficient of expansion of tape per $1°F = 6.2 \times 10^{-6}$. **(06 Marks)**

Module-2

3   a. Define the terms : (i) True bearing (ii) Magnetic bearing (iii) Magnetic declination and (iv) Angle of dip. **(06 Marks)**
    b. Differentiate between prismatic and surveyor compass (any 4). **(06 Marks)**
    c. The following bearings were observed in running a closed traverse:

Line	F.B.	B.B.
AB	75°5'	254°20'
BC	115°20'	296°35'
CD	165°35'	345°35'
DE	224°50'	44°5'
EA	304°50'	125°5°

At what station do you suspect the local attraction? Determine the correct magnetic bearings. If declination was 5°10' E. What are the true bearings? **(08 Marks)**

OR

4   a. Explain the Bowditch's and Transit method of adjusting closed traverse. **(06 Marks)**
    b. Explain closed and open traverse with neat sketch. **(06 Marks)**
    c. The following records were obtained in a compose traverse. Compute the length and bearing of DA:

Line	Length (m)	Bearing
AB	75.5	30°24'
BC	180.5	110°36'
CD	60.25	210°30'
DA	?	?

(08 Marks)

Module-3

5   a. Define the following terms:
    (i) Back sight   (ii) Fore sight   (iii) Benchmark   (iv) Reduced level. **(06 Marks)**
    b. What are the methods of leveling? Explain briefly. **(06 Marks)**

c. The following consecutive readings were taken with a level and 5 m leveling staff on continuously sloping ground at a common interval of 20 m. 0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110 and 4.485 m. The reduced level of first point was 208.125 m. Rule out a page of level field book and enter the above readings. Calculate the reduced levels of points by rise and fall method and apply check. Calculate also the gradient of line joining the first and last point. **(08 Marks)**

OR

6 a. Illustrate with neat sketches:
  (i) Profile leveling   (ii) Differential leveling
  (iii) Fly leveling and   (iv) Reciprocal leveling   **(08 Marks)**
  b. Enumerate the errors in leveling.   **(04 Marks)**
  c. The following notes refer to reciprocal levels taken with one level:

Inst. at	P	Q	Remarks
P	1.824	2.748	Distance between P and Q = 1010 m
Q	0.928	1.606	RL of P = 126.386

Find :
(i) True RL of Q   (ii) The combined correction for curvature and refraction and
(iii) The angular error in the collimation adjustment of the instrument.   **(08 Marks)**

Module-4

7 a. Explain with neat sketch, the procedure for,
  (i) Radiation method
  (ii) Intersection method and
  (iii) Traversing method in plane table surveying   **(09 Marks)**
  b. State and explain solution to two-point problem.   **(08 Marks)**
  c. Define Re-section.   **(03 Marks)**

OR

8 a. State and explain solution to three point problem.   **(10 Marks)**
  b. List the advantages, disadvantages and errors in plane table surveying.   **(10 Marks)**

Module-5

9 a. Discuss the methods for determining areas and volume.   **(08 Marks)**
  b. Define a contour. List the uses of contour maps.   **(04 Marks)**
  c. The following perpendicular offsets were taken from a chain line to a hedge:

Chainage (m)	0	15	30	45	60	70	80	100	120	140
Offsets (m)	7.6	8.5	10.7	12.8	10.6	9.5	8.3	7.9	6.4	4.4

Calculate the area between survey line, the hedge and end offsets by,
  (i) Trapezoidal rule.   (ii) Simpson's rule.   **(08 Marks)**

OR

10 a. What are the characteristics of contour? Explain with sketches.   **(07 Marks)**
  b. List the methods of contouring. Explain briefly.   **(05 Marks)**
  c. A railway embankment 400 m long is 12 m wide at the formation level and has side slope of 2 to 1. The ground levels at every 100 m along the centre line are as under.

Distance (m)	0	100	200	300	400
R.L (m)	204.8	206.2	207.5	207.2	208.3

The formation level at zero chainage is 207.00 and the embankment has a rising gradient of 1 in 100. The ground is level across the centre line. Calculate the volume of earth work by,
  (i) Trapezoidal formula.   (ii) Prismoidal formula.   **(08 Marks)**

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18CV36

Third Semester B.E. Degree Examination, Feb./Mar. 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. Using diagrams and explanation, describe the Internal Structure and Composition of Earth.
(10 Marks)
   b. Write the Physical properties, Chemical composition and uses of Feldspar group of Minerals. **(06 Marks)**
   c. Differentiate between Rock Forming Mineral and Ore Mineral. **(04 Marks)**

OR

2 a. Discuss the relevance of Geology in Civil Engineering Profession. **(08 Marks)**
   b. Using appropriate examples from the Mineral Kingdom, describe the physical properties of Minerals. **(08 Marks)**
   c. Differentiate between Calcite and Magnetite. **(04 Marks)**

Module-2

3 a. Mention the Mineralogical composition texture, Origin and uses of
   i) Granite   ii) Sandstone   iii) Marble   iv) Shale. **(08 Marks)**
   b. Explain any three types of Drainage patterns. **(06 Marks)**
   c. With neat sketch, explain the Soil profile. **(06 Marks)**

OR

4 a. Give a detailed account of Structure of Sedimentary Rocks. **(08 Marks)**
   b. Explain the types of Metamorphism. **(06 Marks)**
   c. Explain the types of Physical Weathering. **(06 Marks)**

Module-3

5 a. Give a detailed classification of folds and their Engineering considerations. **(08 Marks)**
   b. Differentiate between Horst and Graben. **(06 Marks)**
   c. List the various Coastline Protection Structures. **(06 Marks)**

OR

6 a. Describe the different types of the joints and mention their Engineering considerations.
(08 Marks)
   b. Give the detailed account of types of Unconformities. **(06 Marks)**
   c. Write short note on Rock Quality Designation. **(06 Marks)**

Module-4

7 a. Give an account of vertical distribution of groundwater. **(06 Marks)**
   b. Write short note on Flood Control measures. **(06 Marks)**
   c. Give the detailed account of types of Aquifers. **(08 Marks)**

OR

8 a. Give an account of the procedure for Seismic Refraction Survey method for Groundwater Exploration.   **(10 Marks)**

   b. Give a detailed account of methods of Artificial Groundwater recharge.   **(10 Marks)**

Module-5

9 a. Write the causes and effects of Earthquakes.   **(08 Marks)**

   b. Write the short note on Seismic Zones of India.   **(06 Marks)**

   c. Write a Short note on Tsunami.   **(06 Marks)**

OR

10 a. Explain the application and limitations of Remote Sensing Techniques.   **(08 Marks)**

   b. Explain the components of GIS.   **(06 Marks)**

   c. Enumerate the applications of Global Positioning System.   **(06 Marks)**

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Third Semester B.E Degree Examination, Feb./Mar. 2022
(CIVIL ENGINEERING)

COMPUTER AIDED BUILDING PLANNING AND DRAWING

Time: 3 Hours   Max. Marks: 100

NOTE:
1. Answer any *TWO* full questions from **PART A** and any *ONE* full question from **PART B**.
2. Assume any missing data suitably.

PART A

Q1   Draw longitudinal section and cross section of a cantilever beam from the following data: Clear projection from the face of RCC column = 2500mm Size of column = 300mm x 300mm Size of beam at fixed end = 300mm x 300mm Size of beam at free end = 300mm x 150mm Reinforcement main bars: #5 - 20ϕ with 2 bars curtailed at 1500mm from the support and show the curtailment plan. Compression bars: #3 - 16ϕ Stirrups: 2L - 6ϕ @ 200 c/c up to 1000mm from support and @ 300 c/c in remaining length**.   (25 Marks)**

Q2   One way continuous slab has been provided for a hall of clear dimensions 8mx14.25m.The slab is supported on RCC beams. The following details are given. C/C distance of supporting beams=3.5m. Column dimensions on which beam rest=250mmx500mm. C/s of beams=250mmx600mm. Slab thickness=150mm. Beam depth is inclusive of slab depth. Main positive reinforcement at the end and interior panels=10ϕ @120 c/c Main negative reinforcement at all supports= 10ϕ @120 c/c. Distribution steel =8ϕ @ 250 c/c. Draw cross section and plan showing the details of reinforcement (Bottom & top). **(25 Marks)**

Q3   Sketch the cross section of a rigid pavement in heavy rainfall area having the following particulars: Width of carriage way = 3.75m Camber (@ 2%) = 38mm Width of Shoulder = 1.5m Granular sub-base (GSB) = 250mm thick Dry lean concrete sub-base = 150mm thick Paving Quality Concrete layer = 240mm thick Total thickness of the pavement = 640mm. **(25 Marks)**

Q4   Prepare a working drawing for an isolated column footing (RCC) for a column size300mm x 300mm reinforced with #8 of 12mm HYSD- steel as main bars together with 2 legged 8ϕ stirrups at 200c/c. Details of footing: Size of footing is 1.6m x 1.6m and the thickness of the footing at theface of the column is 450mm which reduces to 300mm at the edge of footing. The matcomprises of 10ϕ TOR- steel at 100 c/c both ways. The footing is provided with PCC bedin 1:3:6 of thickness 75mm.Depth of foundation is1.5m from natural ground level. **(25 Marks)**

PART B

Q5   Line diagram of Hospital building is given in Figure Q5. .Draw to scale the following:
   a)   Plan at sill
   b)   Front elevation
   c)   Section along XX.
   d)   Schedule of Openings   **(50 Marks)**

Q6   Line diagram of Single Storey residential building is given in Figure Q6. Draw to scale the following:
   a)   Plan at sill
   b)   Front elevation
   c)   Section along AA.
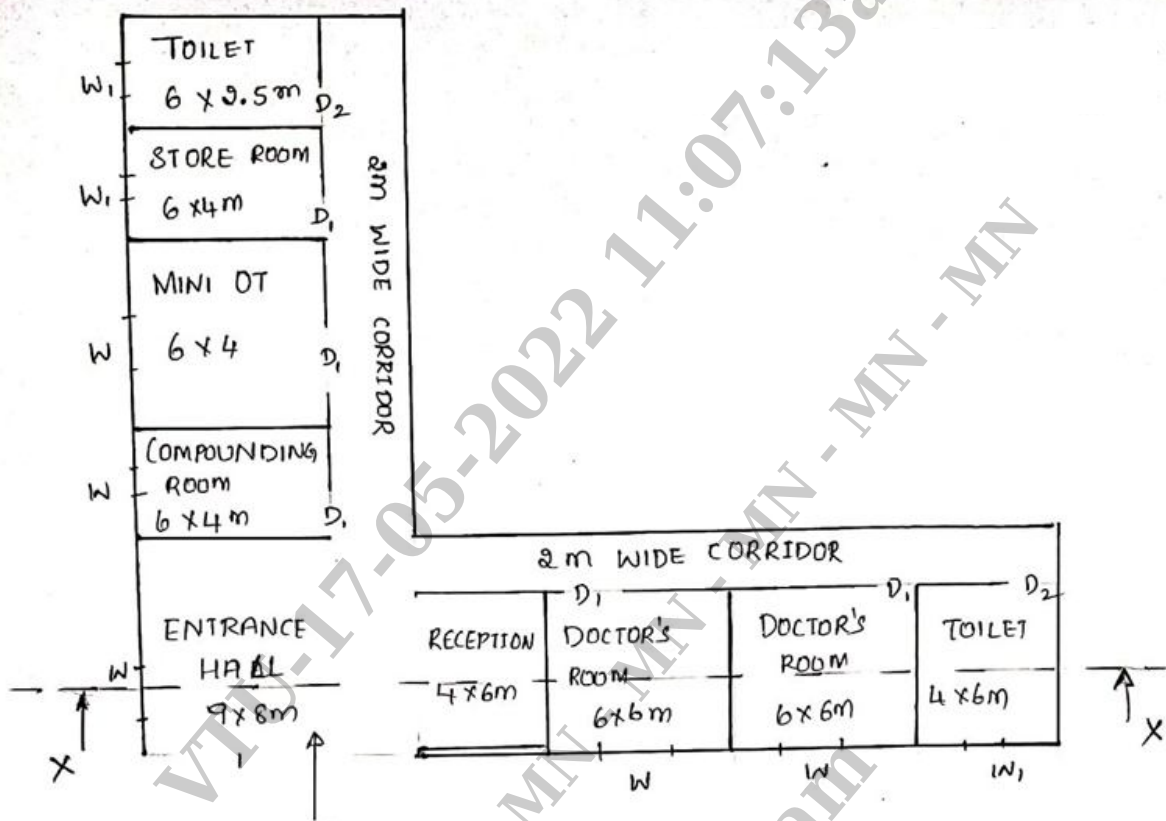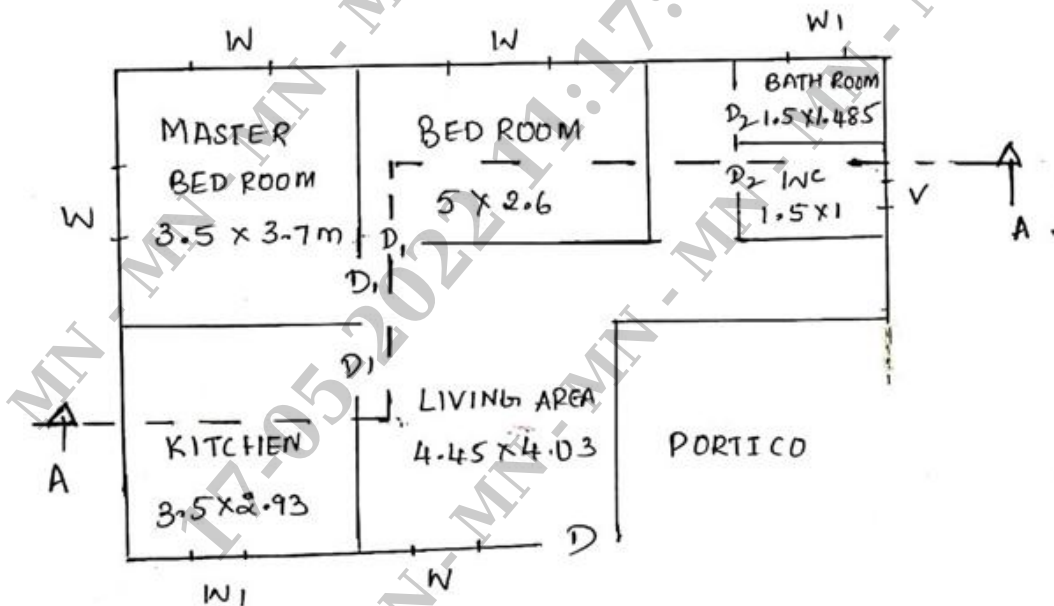   e)   Schedule of Openings   **(50 Marks)**

Figure Q5

Figure Q6

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Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Construction Management and Entrepreneurship

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Explain the functional areas of Management.   **(08 Marks)**
   b. List and explain the Nature or characteristics of Planning.   **(08 Marks)**
   c. Discuss the dependencies in a Gantt chart, with neat sketches. **(04 Marks)**

OR

2 a. With illustration, explain AOA and AON network diagrams.   **(08 Marks)**
   b. The activity data of a project is given in the table below :

Activity	Predecessor	Duration
A	-	5
B	A	4
C	-	6
D	C	3
E	-	5
F	E	3
G	D, F	6
H	D, F	8
I	B, G	4
J	B, G	7
K	H, I	5
L	J, K	2

   Draw the network diagram , Identify the critical path and Project duration using CPM.
                                                                      (08 Marks)
   c. Discuss the types of Management Styles.   **(04 Marks)**

Module-2

3 a. Explain i) Minimum Wages Act 1948   ii)   The Labour Welfare Fund Act 1965
                                                                      (08 Marks)
   b. Explain the importance of Resource Management in the construction of a Project. **(08 Marks)**
   c. Discuss the types of Maintenance.   **(04 Marks)**

OR

4 a. Define Labour Production Rate or Productivity. Discuss the factors affecting Productivity.
                                                                      (10 Marks)
   b. The initial cost of a piece of construction equipment is Rs 35,00,000. It has a useful life of 10 years. The estimated salvage value of the equipment at the end of useful life is Rs 5,00,000. Calculate the Annual depreciation and Book value of the construction equipment using Sinking fund method. The interest rates is 8% per year.   **(10 Marks)**

Module-3

5 a. Explain the process of Project Quality Management. **(10 Marks)**
   b. Explain the Safety measures adopted during drilling and blasting. **(10 Marks)**

OR

6 a. Discuss in detail about the cost of Quality in construction. **(10 Marks)**
   b. Explain the types of Conflict of Interest. **(06 Marks)**
   c. Discuss the following :
      i) Gifts and Bribes   ii) Whistle Blowing. **(04 Marks)**

Module-4

7 a. Define Engineering Economics. Explain the principles of Engineering Economy. **(08 Marks)**
   b. With illustration, explain Cash Flow diagram. **(06 Marks)**
   c. Differentiate between Micro and Macro Economics. **(06 Marks)**

OR

8 a. Explain Break Even Analysis. Mention the assumptions of Break Even Analysis. **(08 Marks)**
   b. A firm has identifies two mutually exclusive investment proposals for new project whose details are given below. The life of all the two alternatives is estimated to be five years with negligible salvage value. The minimum attractive rate of return for the firm is 12%. Find the best alternative based on the rate of Return method of Comparison. **(12 Marks)**

	Alternative 1	Alternative 2
Investment	1,50,000/-	3,10,000/-
Annual Net Income	50,000/-	90,000/-

Module-5

9 a. Explain the stages in Entrepreneurial Process. **(10 Marks)**
   b. Discuss in detail about the Project report for starting a new Venture. **(10 Marks)**

OR

10 a. Explain the role and significance of Venture Capital. **(10 Marks)**
   b. Mention the objectives and functions of following agencies :
      i) KIADB   ii) TECSOK. **(10 Marks)**

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USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   **18CV52**

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Analysis of Indeterminate Structures

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data suitably.

Module-1

1   Analyze the continuous beam shown in Fig.Q.1 by slope deflection method. Draw BMD and SFD.   **(20 Marks)**
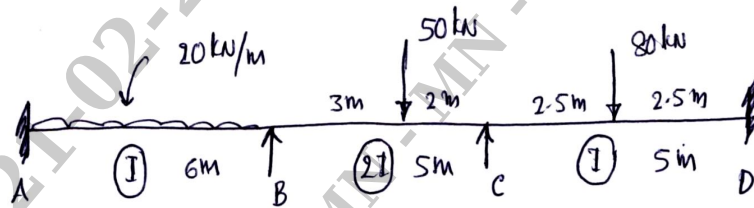

Fig.Q.1

OR

2   Analyze the portal frame shown in Fig.Q.2 by slope deflection method. Draw BMD.
                                                                                   (20 Marks)

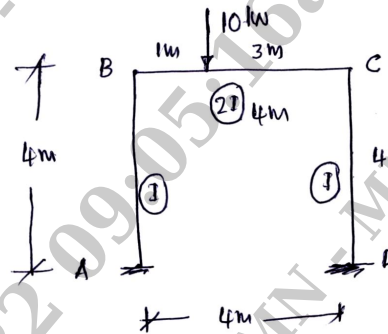Fig.Q.2

Module-2

3   Analyze the beam shown in Fig.Q.3 by moment distribution method. Draw BMD EI is constant.   **(20 Marks)**
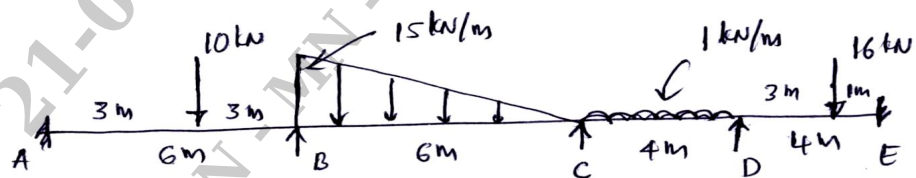

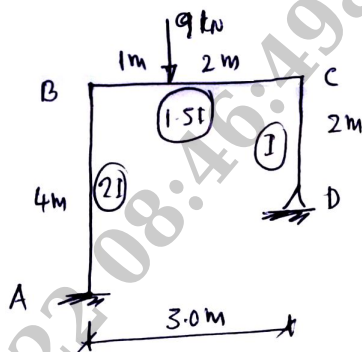Fig.Q.3

OR

4 Analyze the portal frame by moment-distribution method draw BMD. **(20 Marks)**

Fig.Q.4

Module-3

5 Analyze the continuous beam loaded shown in Fig.Q.5 by Kani's rotation method. Draw BMD. **(20 Marks)**
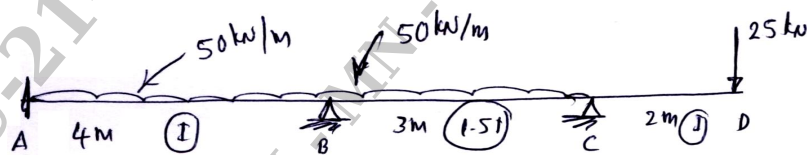

Fig.Q.5

OR

6 Analyze the frame shown in Fig.Q.6 by Kani's method. Take the advantage of symmetry. **(20 Marks)**
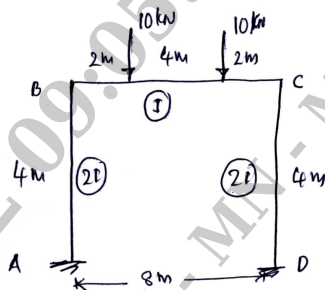
Fig.Q.6

Module-4

7 Analyze the continuous beam by flexibility matrix method (system approach). Draw BMD. (Fig.Q.7). **(20 Marks)**

Fig.Q.7

2 of 3
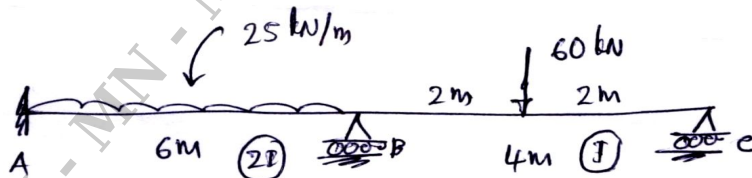
OR

8 Analyze the L-frame shown in Fig.Q.8 by flexibility matrix method. Draw BMD (system approach). **(20 Marks)**

Fig.Q.8
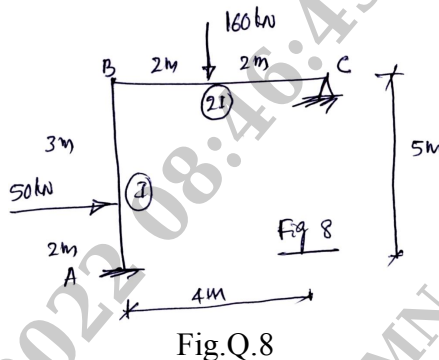
Module-5

9 Analyze the continuous beam by stiffness matrix method (system approach) shown in Fig.Q.9. Draw BMD EI is constant. **(20 Marks)**
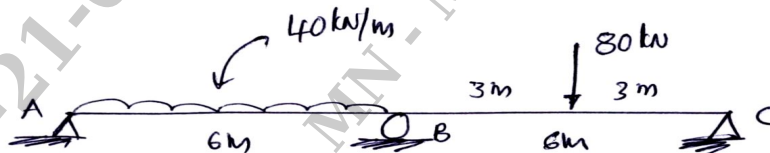

Fig.Q.9

OR

10 Find the forces in the members of a joint 'O' shown in Fig.Q.10 by stiffness matrix method. (system approach). **(20 Marks)**
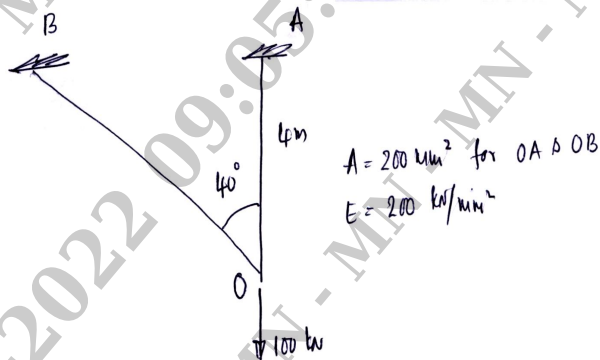

Fig.Q.10

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Fifth Semester B.E. Degree Examination, Feb./Mar. 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. Assume any missing data.
3. Use of IS-456, SP-16 chart permitted.

Module-1

1   a.   Explain the following:
     i)   Partial safety factors for loads and materials.
     ii)   Explain the principles of limit state design.   **(10 Marks)**
  b.   Explain under reinforced section, over-reinforced section, balance section with neat sketches and also show that $X_{ulim} = 0.53d$, for Fe250 grade of steel.   **(10 Marks)**

OR

2   a.   Briefly explain the step by step procedure for short term deflection and long term deflection.   **(10 Marks)**
  b.   A flanged beam of T-section is simply supported over an effective span of 8m. The beam has effective flange width of 1400mm, thickness of flange as 150mm, breadth of web as 300mm and effective depth of 450mm. It is reinforced with 4 bars of 25mm diameter in tension and 3 bars of 16mm diameter in compression, check the beam for deflection. Use M_{20} grade concrete and Fe415 steel.   **(10 Marks)**

Module-2

3   A R.C.C beam of rectangular section $300 \times 600mm$ is reinforced with 4 bars of 20mm diameter with an effective cover 50mm, effective span of the beam is 6m. Assuming M_{20} concrete and Fe250 steel. Determine the central concentrated load P, that can be carried by the beam in addition to its self weight.   **(20 Marks)**

OR

4   a.   Find the steel for a rectangular section $300 \times 600mm$ to support a load of 80kN/m with span of 6m (effective) and cover 40mm (effective) adopt M_{20} concrete Fe415 steel.   **(10 Marks)**
  b.   A singly reinforced beam $250 \times 500mm$ is reinforced with $4 - 16mm$ diameter and cover 40mm (effective) with effective span 6m. Determine the central point load that can be applied at mid span adopt M_{20} concrete Fe500 steel.   **(10 Marks)**

Module-3

5   A T-beam slab floor gas 125mm thick slab forming part of T-beam which are of 8m clear span. The end bearing are 450mm thick, spacing of T-beams is 3.5m. The live load on the floor is 3kN/m². Design one of the intermediate beams. Use M_{20} concrete and Fe415 steel.   **(20 Marks)**

OR

6 A rectangular beam is to be simply supported on supports of 300mm width. The clear span of the beam is 6m. The beam is to have width of 230mm. The characteristic superimposed load is 12kN/m. Using M_{20} and Fe500 steel, design the beam and sketch details of reinforcement. **(20 Marks)**

Module-4

7 A hall has clear dimensions 3m × 9m with wall thickness 230mm. The live load on the slab is 3kN/m^2 and finishing load 1kN/m^2 may be assumed. Use M_{20} grade concrete and Fe415 steel. Design the slab, check for shear and deflection. **(20 Marks)**

OR

8 Design a dog-legged stairs for an building in a room measuring 3.6 × 5.2m clear span. The vertical distance between the floors is 3.2m. Consider LL 3kN/m^2. Use M20 concrete and Fe415 grade of steel. Assume stairs are supported on 300mm wall at the outer edges of landing slabs consider Rise = 160mm and Tread = 300mm. **(20 Marks)**

Module-5

9 a. Distinguish between short column and long column. **(05 Marks)**

   b. Design a circular pin ended column 400mm diameter and helically reinforced with an unsupported length 4.5m to carry a factored load 900kN. Assume M_{30} concrete and Fe415 steel. **(15 Marks)**

OR

10 Design a Isolated rectangular footing of uniform depth for the column size of 230mm × 300mm supporting an axial service load of 850kN. The safe bearing capacity of soil is 150kN/m^2. Adopt M_{20} grade concrete and Fe415 grade steel sketch the reinforcement details. **(20 Marks)**

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18CV54

Fifth Semester B.E. Degree Examination, Feb./Mar. 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. Define the following:
   (i) Water content   (ii) Void ratio
   (iii) Unit weight of soil   (iv) Density index   **(06 Marks)**

   b. Prove the relation $\gamma_{dry} = \dfrac{Gr_w}{1+e}$ and Se = wG from basic principles. **(08 Marks)**

   c. A soil has a bulk unit weight of 26 kN/m^3, G = 2.76 and water content 16%. Determine the dry unit weight, void ratio, porosity and degree of saturation. What is the unit weight if the soil gets fully saturated due to rain? **(06 Marks)**

OR

2   a. With the help of the phase diagram, define the terms bulk density, dry density, degree of saturation and specific gravity of soil solids. **(08 Marks)**

   b. Following are the results obtained from the tests conducted on two soils A and B. Classify them as per IS classification system. Explain the steps involved.

Soil	W_L (%)	W_P (%)	% retained on 75 μ sieve	% retained on 4.75 mm Sieve	C_u	C_c
A	110	50	40	Zero	-	-
B	-	-	92	05	0.7	0.2

(06 Marks)

   c. Explain the determination of specific gravity of soil solids by pycnometer method. **(06 Marks)**

Module-2

3   a. Explain different types of soil structures. **(08 Marks)**

   b. Discuss the factors affecting compaction in detail. **(06 Marks)**

   c. Determine the relative compaction of soil if the field density is 18.51 kN/m^3; whose HDD is 22 kN/m^3 and OMC is 13%. Comment on that. **(06 Marks)**

OR

4   a. Explain different types of clay minerals. **(08 Marks)**

   b. A proctor compaction test was conducted on a soil sample and the following observations were made:

W.C. (%)	8	11.5	14.5	17.5	19.5	21.5
Mass of the soil (kg)	1.70	1.90	2.0	1.98	1.95	1.92

If the volume of the mould is 950 C.C. and specific gravity of soil was 2.65, draw the:
   (i) Dry density v/s moisture content curve and get the maximum dry density and optimum moisture content.
   (ii) 100% saturation line.
   (iii) Also calculate the minimum void ratio and saturation at OMC. **(12 Marks)**

Module-3

5 a. List the factors affecting permeability in soils. Explain any four. **(08 Marks)**

b. An earth dam is built on an impervious foundation with a horizontal filter under the downstream slope. The horizontal and vertical permeabilities of the soil material in the dam are 4×10^{-3} and 1×10^{-3} cm/s respectively. The full reservoir level is 15 m above downstream filter. A flow net, constructed for the transformed section of the dam, consists of 4 flow channels and 15 equipotential drops. Estimate the seepage loss per m length of the dam. **(08 Marks)**

c. A stratum of fine sand is 2m thick. Under what head of water, flowing in an upward direction will the quick condition develop? Take G = 2.68 and e = 0.6. **(04 Marks)**

OR

6 a. Explain Casagrande's method of establishing the phreatic line of an earth dam with horizontal drainage filter on the downstream side. **(08 Marks)**

b. Derive the expression for the determination of coefficient of permeability of the soil by falling head method. **(06 Marks)**

c. Differentiate between: (i) Total stress (ii) Pore water pressure (iii) Effective stress **(06 Marks)**

Module-4

7 a. Derive the relation $\sigma_1 = \sigma_3 \tan^2 \alpha + 2c \tan \alpha$. **(08 Marks)**

b. A shear box test conducted on a soil sample gives the following observations:

Normal load (N)	360	720	1080	1440
Shear load proving ring dial reading (divisions)	13	19	26	32

If the shear box is 60 mm square and proving ring constant is 20 N per division. Find out the shear parameters (C & ϕ) of the soil in kN/m^2 and degrees respectively. **(12 Marks)**

OR

8 a. Write a note on Vane Shear test. **(08 Marks)**

b. The following data relate to a triaxial compressive test performed on a soil samples.

Test No.	Confining Pressure (kN/m^2)	Deviatric Stress (kN/m^2)
1	80	175
2	150	240
3	210	300

Determine the total stress parameters of the soil. **(12 Marks)**

Module-5

9 a. What is pre-consolidation pressure? How it is determined by Casagrande's method? **(08 Marks)**

b. Explain pre-consolidated, normally consolidated and under consolidated soil. **(04 Marks)**

c. A 30 cm thick sample of clay reached 30% consolidation in 15 minutes with drainage both at top and bottom. How long will it take the clay layer from which the sample was obtained to reach 50% consolidation? The clay layer has one-way drainage and was 6 m thick. **(08 Marks)**

OR

10 a. Explain the determination of coefficient of consolidation by square root of time fitting method. **(08 Marks)**

b. A 3 m thick layer of clay was subjected to a loading of 0.7 kg/cm^2. It attained 50% consolidation after 1 year. The layer had double drainage. Determine:
(i) Coefficient of consolidation   (ii) Settlement after one year if k = 5 mm/yr
(iii) Time required for 90% consolidation **(12 Marks)**

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Fifth Semester B.E. Degree Examination, Feb./Mar. 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 different types of sewerage systems with their advantages, disadvantages and suitability. **(10 Marks)**
   b. Explain Dry Weather Flow (DWF) and explain the factors on which DWF depends. **(10 Marks)**

OR

2 a. Define sewer appurtenances. Explain with neat sketch, construction and working of manhole. **(10 Marks)**
   b. Explain any five different shapes of sewers with neat sketches. **(10 Marks)**

Module-2

3 a. Design a sewer for a population of 50,000 with per capita water supply of 150 lit/day. The slope available is 1 in 500 and 80% of the water supplied emerges as sewage. The sewer is to be designed to carry 4 times the DWF when running full. Assume N = 0.012 and compute the velocity of flow when running full. **(10 Marks)**
   b. Explain self cleaning velocity and non-scouring velocity. What are different types of sampling? Explain. **(10 Marks)**

OR

4 a. Draw a neat flow diagram employed for a municipal wastewater treatment plant. Indicate the importance of each unit indicated in the flow diagram. **(10 Marks)**
   b. The 5 day 30°C BOD of sewage sample is 110 mg/*l*. Calculate its 5 days 20°C BOD. Assume the deoxygenation constant at 20°C, K_{20} as 0.1. **(06 Marks)**
   c. Explain the term BOD and their importance in wastewater treatment. **(04 Marks)**

Module-3

5 a. Explain the working of a "Grit Chamber" and "Oil and Grease" removal tank with figures. **(10 Marks)**
   b. Write short notes on: (i) Screens　(ii) Settling tank **(10 Marks)**

OR

6 a. Discuss in detail the process of de-oxygenation and re-oxygenation with respect to self-purification of natural water with a neat sketch. **(10 Marks)**
   b. A city discharges 100 cumecs of sewage into a river which is fully saturated with oxygen and flowing at the rate of 1500 cumecs during its lean days with a velocity of 0.1 m/sec. The 5-days BOD of sewage at the given temperature is 280 mg/*l*. Find when and where the critical D.O. deficit will occur in the downstream portion of the river, and what is its amount. Assume coefficient of purification of the steam (f) as 4.0 and coefficient of de-oxygenation (K_D) as 0.1. (Take saturated D.O. = 9.2 mg/*l*). **(10 Marks)**

Module-4

7 a. Explain the five modifications of activated sludge processes. **(10 Marks)**

b. The sewage is flowing at 4.5 million litres per day from a primary clarifier to a standard rate trickling filter. The 5-day BOD of the influent is 160 mg/l. The value of the adopted organic loading is to 160 gm/m^3/day, and surface loading 2000 l/m^2/day. Determine the volume of the filter and its depth. Also calculate the efficiency of this filter unit. **(10 Marks)**

OR

8 a. Explain briefly with neat sketches, the working of :
   (i) Sludge digester's
   (ii) Sludge drying beds **(10 Marks)**

b. Calculate the dimensions of an oxidation pond for treating sewage from a residential colony with a population of 5000 persons. Assume the rate of sewage flow 120 $l$pcd and 5 day BOD of sewage as 300 mg/l. Take organic loading as 300 kg/ha/day and length of the tank as twice of its width and depth of pond as 1.2 m. Apply check for detention time. **(10 Marks)**

Module-5

9 a. Write about the need for advanced wastewater treatment? Explain the biological phosphorus removal process. **(10 Marks)**

b. What is the necessity for the removal of nitrogen? Discuss the nitrification and denitrification process for removal of nitrogen. **(10 Marks)**

OR

10 a. Explain the septic tank with neat sketch. Also write the design considerations required for septic tank. **(10 Marks)**

b. Write brief note on with sketch:
   (i) Two-pit latrines
   (ii) Soak pits **(10 Marks)**

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18CV56

Fifth Semester B.E. Degree Examination, Feb./Mar.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. What are the characteristics of road transport in comparison with other systems? **(06 Marks)**

b. List the significant recommendations of Jayakar committee. What are the implementations based on Jayaker committee recommendation. **(06 Marks)**

c. For the following data of population units of 0.5, 1.0, 2.0 and 1.0 per 1000 tonnes, 500 tonnes and 100 tonnes of agricultural, raw material and industrial products respectively. Find the priority for the following system of roads.

Proposal	Length (km)	Population range			Productivity		
		<1000	1001 – 2000	> 2000	Agri	Raw material	Industrial Products
A	25	20	15	25	8000	4000	1000
B	35	30	20	40	6000	1000	1600
C	40	50	20	60	4500	2000	3200
D	30	15	12	30	4000	6000	500

(08 Marks)

OR

2 a. What is an ideal alignment? Explain with neat sketches, how you will align through, (i) Hill pass, (ii) Bridge site (iii) Marshy land. **(08 Marks)**

b. Determine the lengths of different categories of roads in a state in India by the year 2001, using the following data:
Area of state : 15000 km^2
No. of towns : 20 numbers
Road density : 82 km/ 100 km^2. **(08 Marks)**

c. List the salient features of KSHIP, PMGSY **(04 Marks)**

Module-2

3 a. Sketch a neat cross section of NH in rural section in embankment and cutting. **(06 Marks)**

b. Calculate the minimum sight distance required to avoid a head on collision of two cars approaching from opposite directions at 90 kmph and 60 kmph. Assume the reaction time of 2.5 sec, co-efficiency of friction of 0.65 and a break efficiency of 55% in either case.

(08 Marks)

c. List the factors affecting skid resistance. **(06 Marks)**

OR

4 a. The speed of overtaking and overtaken vehicles are 80 and 50 kmph respectively on a 2-way traffic road. If acceleration of overtaking vehicle is 0.99 m/sec^2. Calculate OSD, mention minimum length of overtaking zone, draw a neat sketch of the minimum overtaking zone and show the positions of the sign post. **(10 Marks)**

b. Derive an expression for super elevation such that speed can be substituted in kmph.

(05 Marks)

c. An ascending gradient of 1 in 100 meets a descending gradient of 1 in 120. A Summit curve is to be designed for a speed of 80 kmph so as to have an overtaking sight distance of 470 m.

(05 Marks)

Module-3

5 a. List and briefly explain the desirable properties of subgrade soil. **(05 Marks)**

b. List and explain desirable properties of Aggregates to be used in road construction. **(05 Marks)**

c. CBR tests were conducted on two specimens of a soil. Determine CBR value of the soil if 100 division of the load dia/proving ring represents 190 kg load in the calibration chart of the proving ring. Use following data:

Penetration of plunger (mm)	Load dial readings, divisions	
	Specimen - 1	Specimen – 2
0	0	0
0.5	8	0.5
1.0	15	1.5
1.5	23	2.5
2.0	29	6.0
2.5	34	13
3.0	37	20
4	43	30
5	48	38
7.5	57	50
10	63	58
12.5	67	63

(10 Marks)

OR

6 a. Differentiate between Tar and Bitumen. **(05 Marks)**

b. List the basic structural components of a flexible pavement and briefly explain the function of the same with a neat figure. **(08 Marks)**

c. Calculate ESWL of a dual wheel assembly carrying 2004 kg each for pavement thickness of 15, 20 cm. Centre to centre spacing = 27 cm and distance between the walls of tyres = 11 cm. **(07 Marks)**

Module-4

7 a. Briefly explain Ruthfutch method. **(10 Marks)**

b. Describe step by step procedure for subgrade preparation, with proper specifications. **(10 Marks)**

OR

8 a. With detailed procedure, describe the method of constructing WBM. **(08 Marks)**

b. Write the specification for Bituminous concrete also provide step by step procedure for laying Bituminous concrete layer. **(09 Marks)**

c. Define Tack coat, Seal coat, Prime coat. **(03 Marks)**

Module-5

9 a. Briefly explain the significance of highway drainage. **(10 Marks)**

b. With neat sketches, explain lowering of water table, control of seepage flow.[Clay seal method and transverse method] **(10 Marks)**

OR

10 a. With a neat relevant sketch, explain the procedure for design of filter material in Highway drainage. **(10 Marks)**

b. Explain briefly the quantifiable benefits for a highway user. **(06 Marks)**

c. Write short notes on BOT and BOOT concepts. **(04 Marks)**

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18CV61

Sixth Semester B.E. Degree Examination, Feb./Mar. 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 and SP 6 or Steel table is permitted.

Module-1

1 a. What are the advantages and disadvantages of steel structures? **(10 Marks)**
   b. What are the rolled steel sections? Explain briefly with neat sketch different rolled steel sections used in steel construction. **(10 Marks)**

OR

2 a. Define the terms, plastic hinge, shape factor, collapse mechanism and upper bound theorem. **(08 Marks)**
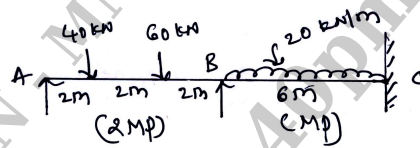   b. Determine plastic moment capacity for the beam shown in the Fig.Q2(b). Take factor load of 2.5 .

Fig.Q2(b) **(12 Marks)**

Module-2

3 a. What are the advantages and disadvantages of bolted connection? **(10 Marks)**
   b. Design a bolted connection for a lap joint of plate thickness 10mm and 12mm to carry a working load of 100 kN. Use M16 bolts of property class 4.6. Assume bolts with threads. **(10 Marks)**

OR

4 a. What are the common defects in welding? Explain briefly with neat sketch. **(08 Marks)**
   b. A tie member of Roof truss consists of 2 ISA 100×75×8 mm and are connected to both the sides of 10mm gusset plate, by longer legs back to back. Factored axial force in the member is 500 kN. Design the weld joint by providing weld
   (i) Along two parallel sides of angle.
   (ii) Along all three sides of connected angle.
   Assume shop weld. **(12 Marks)**

Module-3

5 a. Explain the different modes of failure of compression members. **(08 Marks)**
   b. Determine the compressive strength of double angle strut 2ISA 90×60×8 mm connected to gusset plate of 10mm thick when
   (i) Two angles on same side [Shorter legs Back to Back]
   (ii) Two angles back to back of a either side of gusset plate [Longer leg back to back]
   Take length of member as 2.5m. **(12 Marks)**

OR

6 Design a build up column consisting of two channels sections placed back to back to carry a load of 1000 kN over a length of 10m. The ends of compression member are restrained in position but not in direction / rotation. Design single lacing system. Use 20mm diameter bolts of property class 4.6 for connection. Given load is working load. **(20 Marks)**

Module-4

7 a. Explain different modes of failure of a tension member with neat sketch and formulae. **(06 Marks)**

b. Design an unequal single angle section to carry a load of 140 kN. Use M_{20} bolts of grade 4.6. The length of member is 3m. **(14 Marks)**

OR

8 a. Explain slab base and gusseted base with neat sketch. **(08 Marks)**

b. Design a slab base for a column ISHB 300@58.8 kg/m subjected to a service load of 1500 kW. The grade of concrete for pedestal is M_{20}, SBC of soil is 180 kN/m^2. **(12 Marks)**

Module-5

9 A floor of hall consist of beams spaced @ 3.5m c/c with clear span of 6m. The beam supports 130 mm thick R.C.C slab. Take imposed load of 5 kN/m^2 and floor finish of 1.5 kN/m^2. Bearing wall is 300mm thick. The beam is laterally supported. Design the beam with necessary checks. **(20 Marks)**

OR

10 a. Briefly explain the factors affecting lateral stability of beams. **(06 Marks)**

b. Explain with neat sketch :
(i) Beam to Beam connection (Bolted)
(ii) Beam to Column connection (Bolted). **(14 Marks)**

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Sixth Semester B.E. Degree Examination, Feb./Mar. 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. *Use of IS : 6403 is allowed.*

Module-1

1 a. What are the objectives of Soil Exploitation?   **(06 Marks)**
    b. Explain Seismic Refraction method with a neat sketch.   **(08 Marks)**
    c. How many types of samples are available? Explain any one sample.   **(06 Marks)**

OR

2 a. Define Area ratio , Inside clearance , Outside clearance, with a neat sketch.   **(06 Marks)**
    b. What is the need of dewatering? Explain any one method of dewatering, with a neat sketch.
                                                                                    (08 Marks)
    c. Establish the location of GW in clayey strata. Water in bore hole was boiled out to a depth of 10.67m below GS and the size of water was recorded at 24hr. Intervals as follows :
        $h_1 = 64.0cm$, $h_2 = 57.9cm$, $h_3 = 51.8cm$.   **(06 Marks)**

Module-2

3 a. Write the expressions for vertical stress, horizontal shear stress of Boussinesq's theory and expression for vertical stress of Westergaard's theory.   **(06 Marks)**
    b. Write a note on Pressure distribution diagrams, with relevant sketches.   **(08 Marks)**
    c. A raft foundation of size $4m \times 4m$ carries a uniform load of $200kN/m^2$. Using the point load approximation with four equivalent point loads. Calculate the stress increment at a point in the soil which is 4m below the centre of the loaded area.   **(06 Marks)**

OR

4 a. Write a detailed note on the construction of Newmark's chart and also use of that chart, with a neat sketch.   **(10 Marks)**
    b. A normal consolidated clay layer is 18m thick. Natural water content is 45% , Saturated unit weight is $18kN/m^3$, Specific gravity is 2.7 and Liquid limit is 63%. The vertical stress increment at the centre of clay layer due to foundation load is $9kN/m^2$. Determine the settlement.   **(10 Marks)**

Module-3

5 a. Define Earth pressure at rest, Active earth pressure and Passive earth pressure, with neat diagrams.   **(06 Marks)**
    b. Explain Culmann's Graphical method, with a neat diagram.   **(06 Marks)**
    c. Determine the lateral earth pressure at rest per unit length of the wall shown in Fig. Q5(c). Also determine the resultant earth pressure. Take $K_o = 1 - sum \phi'$, $r_w = 10kN/m^3$.

Fig. Q5(c)
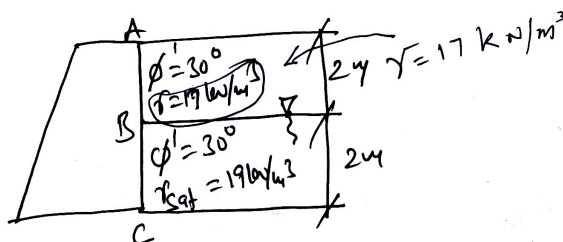

                                                                                    (08 Marks)

OR

6 a. Write a note on Infinite slopes. **(06 Marks)**

b. Explain method of slices for C - ϕ soil with a neat sketch. **(08 Marks)**

c. A canal having side slopes 1 to 1 is proposed to be constructed in a cohesion soil to a depth of 5m below ground surface. The soil properties are $\phi_4 = 15°$, $C_u = 12$KPa , $e = 1.0$, $G_s = 2.65$. Using Taylor's stability number , find the factor of safety with respect to cohesion against failure of the bank slopes.
   i) When the canal is full of water ($S_n = 0.08$).
   ii) When there is a sudden drawdown of water in the canal ($S_n = 0.125$). **(06 Marks)**

Module-4

7 a. Define UBC , SBC , SBP , ABP with usual notations. **(08 Marks)**

b. What are the assumptions and limitations of Terzaghi's theory? **(06 Marks)**

c. A square footing 2.5m × 2.5m is built on a homogeneous bed of sand of density 19kN/m^3 and having an angle of shear resistance of 36°. The depth of foundation is 1.5m below the ground surface. Calculate the safe load that can be applied on the footing with a factor of safety 3. Take BC factors as $N_C = 27$, $N_q = 30$, $N_r = 35$. **(06 Marks)**

OR

8 a. Differentiate between GSF , LSF and PSF. **(06 Marks)**

b. Write the expression for calculation of bearing capacity from IS code and name the variables. **(06 Marks)**

c. A strip footing 2m wide carries a load intensity of 400 kN/m^2 at a depth of 1.2m in sand. The γ_{sat} of sand is 19.5kN/m^3 and unit weight above WT is 16.8 kN/m^3 , $\phi = 35°$. Using Terzaghi's analysis, determine factor of safety with respect to shear failure for the following cases. Take $N_q = 41.4$, $N_r = 42.4$. i) WT is 4m below GL   ii) WT is 1.2m below GL. **(08 Marks)**

Module-5

9 a. Write a note on classification of poly based functions. **(08 Marks)**

b. Give the expressions for ℓcc of piles on cohesive and cohesionless soils from IS code with usual notations. **(06 Marks)**

c. Write a note on Settlement of pile group on clay. **(06 Marks)**

OR

10 a. What is the significance of Pile group? What are the factors affecting the group capacity η_g? **(06 Marks)**

b. Write a note on under reamed piles with its specification and applications, with a neat sketch. **(08 Marks)**

c. As square group of a piles was driven in to soft clay extending to a large depth. The diameter and length of the piles were 30cm and 9m respectively. if the unconfined compressive strength of the clay is 90 KPa, and the pile spacing is 90cm center to centre, what is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75. **(06 Marks)**

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18CV63

Sixth Semester B.E. Degree Examination, Feb./Mar.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. Explain the importance of hydrology. **(10 Marks)**
   b. The average rainfall of 5 rain gauge stations in a basin are 89, 54, 45, 41 and 55 cm. If the error in the estimation of basin rainfall should not exceed 10%. How many additional rain gauges should be installed in the basin? **(10 Marks)**

OR

2 a. Explain with a neat sketch Horton's Engineering representation of hydrological cycle. **(10 Marks)**
   b. The isohytes drawn for a storm occurred over a drainage basin yielded the following information. Find out the depth of the rainfall.

Isohytes interval (mm)	9 – 10	10 – 11	11 – 12	12 – 13	13 – 14	14 – 15
Area (km^2)	22	80	105	98	78	16

(10 Marks)

Module-2

3 a. Explain what is Evapo-transpiration and factors affecting Evapo-transpiration. **(10 Marks)**
   b. The total observed runoff volume during a storm of 6 hr. duration with a uniform intensity of 20 mm/hr is 220 Mm^3. If the area of the basin is 3000 km^2. Find the average infiltration rate and the runoff coefficient of the basin. **(10 Marks)**

OR

4 a. Explain with a neat sketch, double ring infiltrometer. Add a note on factors affecting infiltration. **(10 Marks)**
   b. A reservoir had a average surface area of 15 km^2 during June. In that month the mean rate of inflow 10 m^3/sec. Mean outflow = 12 m^3/sec, Monthly rainfall = 10 cm and change in the storage = 12 Mm^3. Assuming the seepage losses to be 1.5 cm. Estimate the evaporation in that month. **(10 Marks)**

Module-3

5 a. Define Hydrograph and explain with a neat sketch components of Hydrograph. **(10 Marks)**
   b. Given below are the observed flow from a storm of 6 hr duration on a stream with a drainage area of 316 km^2. Assume a constant base flow of 17 cumecs. Derive and plot a 6 hr duration unit hydrograph.

Time (hr)	0	6	12	18	24	30	36	42	48	54	60	66	72
Flow (cumec)	17	113.2	254.5	198	150	113.2	87.7	67.9	53.8	42.5	31.1	22.64	17

(10 Marks)

OR

6 a. Explain the runoff and factors affecting on it. **(10 Marks)**

b. The following ordinates are of 3 hr. unit hydrograph. Find out the volume of surface runoff from 1.5 cm effective rainfall of 3 hr. duration.

Time(hr)	0	6	12	18	24	30	36	42	48	54	60
Unit hydrograph ordinates	0	5.1	21.6	27	23.5	17	10.7	6.2	3.2	1	0

(10 Marks)

Module-4

7 a. Explain with a neat sketch, Bandhars Irrigation. List out its advantages and disadvantages.
(10 Marks)

b. An area irrigated by a distributor is 220 ha out of which 150 ha is Jowar and 70 ha is sugarcane. If delta for Jowar is 45 cm and sugar cane is 180 cm. Average annual transit losses are 40%. Calculate the duty of each crop at the head of distributory. Base period for Jowar is 120 days and for sugar cane 365 days. **(10 Marks)**

OR

8 a. Discuss in benefits and ill effects of irrigation. **(10 Marks)**

b. A Kharif crop having a duty of 2500 ha/cumecs and the delta for the crop is 0.425 m. Find the base period of the crop. **(10 Marks)**

Module-5

9 a. Define a canal and explain the types of canals in detail. **(10 Marks)**

b. A canal flowing at a rate of 120 litre/sec, delivers 100 litres/sec to the field. An area of 1.62 ha was irrigated in 8 hr. The effective depth of root zone is 1.70 m. The runoff loss in the field is 425 m^3. Available moisture holding capacity of soil is 20 cm per metre depth of soil. Irrigation is started at a moisture extraction level of 50% of the available moisture. Determine the water conveyance efficiency (n_e) and water application efficiency. **(10 Marks)**

OR

10 a. Discuss on canal alignment considerations in detail. **(10 Marks)**

b. Explain the zones of storage in a reservoir with a neat sketch. **(10 Marks)**

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18CV642

Sixth Semester B.E. Degree Examination, Feb./Mar. 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 Management. Explain the sources of Municipal Solid Waste. **(10 Marks)**
　b.　Estimate the content of solid waste sample on unit energy content on dry basis and on ash free dry basis. Assume 5% as ash content.

Waste Composition	Mass by %	Moisture content %	Energy Kj/Kg
Food waste	15	70	4650
Paper	45	06	16750
Card board	10	05	16300
Plastic	10	02	32600
Garden trimmings	10	60	6500
Wood	05	20	18600
Tin can	05	03	700

(10 Marks)

OR

2　a.　With a neat sketch, explain the Operational sequence of stationary and hauled container system. **(10 Marks)**
　b.　Write short notes :
　　i)　Municipal collection system　　　ii)　Transfer station. **(10 Marks)**

Module-2

3　a.　Explain the Mechanical Reduction and Mechanical Volume Reduction. **(10 Marks)**
　b.　Explain briefly the process Techniques involved in the treatment of MSW as well as material recycle. **(10 Marks)**

OR

4　a.　Explain the following component separation techniques :
　　i)　Magnetic separation　　　ii)　Hand sorting　　　iii)　Air separation. **(10 Marks)**
　b.　Explain briefly the purpose of Waste Processing. **(10 Marks)**

Module-3

5　a.　Explain the factors affecting Composites. **(10 Marks)**
　b.　Enumerate the different gases found in land fill site and explain the different methods to control the same. **(10 Marks)**

OR

6　a.　Describe the Aerobic and Anaerobic Compositing. **(10 Marks)**
　b.　Explain the various factors to be considered in the selection of a site for a sanitary land fill. **(10 Marks)**

Module-4

7 a. Categories the Biomedical waste and how to treat these waste. **(10 Marks)**

    b. Briefly explain the sources and disposal of Construction wastes. **(10 Marks)**

OR

8 a. What are the sources of E – Waste? Briefly explain the disposal of E - Waste. **(10 Marks)**

    b. Briefly explain the characteristic of Construction and Demolition waste. **(10 Marks)**

Module-5

9 a. Briefly explain the objectives of Incineration. **(10 Marks)**

    b. Explain the factors required for land treatment operation of Hazardous wastes. **(10 Marks)**

OR

10 a. Explain in brief, the factors that affects the Incineration process. **(10 Marks)**

     b. Write explanatory notes on :

       i) Energy Recovery Techniques   ii) Pyrolysis. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Quantity Surveying and Contracts Management

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 What is an estimate? Explain briefly purpose and different types of estimates (any three).

(20 Marks)

OR

2 The details of two room building are shown in the Fig.Q2. Estimate quantities and cost of the following items of work:

(i) Earthwork excavation foundation at Rs.380/m^3

(ii) Bed concrete 1 : 4 : 8 for foundation at Rs.2600/m^3

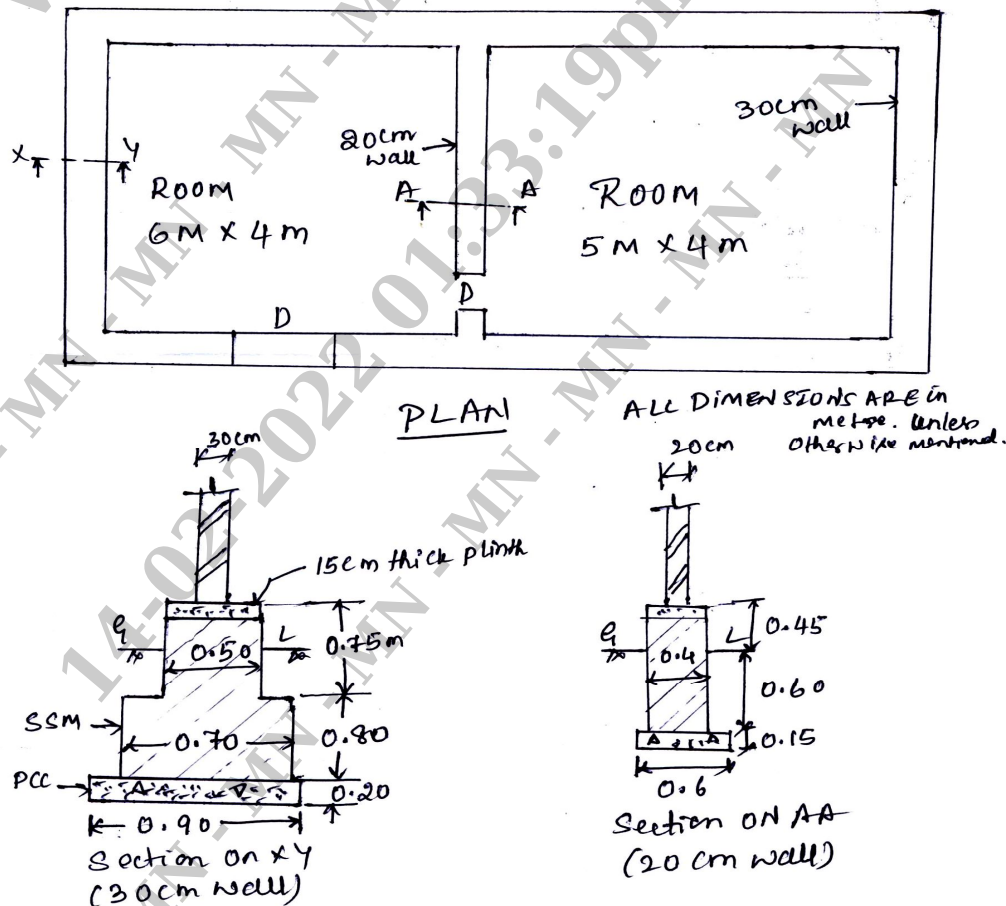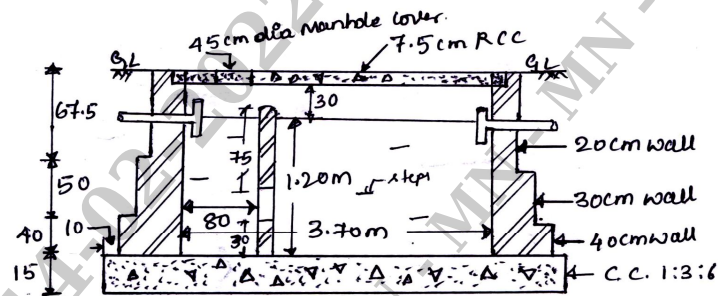(iii) S.S.M. for foundation and basement at Rs.3600/m^3
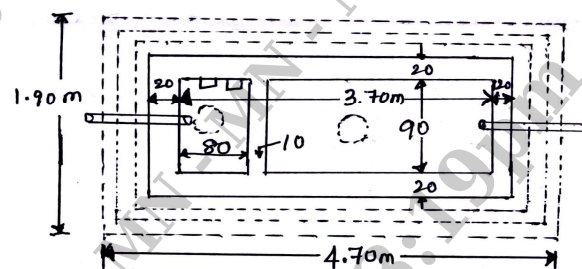

Fig.Q2

(20 Marks)

Module-2

3 The details of septic tank are shown in Fig.Q3. Estimate the quantities of following items and cost. **(20 Marks)**

(i) Earthwork excavation at Rs. 400/m^3

(ii) PCC 1 : 3 : 6 for bed at Rs. 2500/m^3

(iii) BBM in CM 1 : 4 at Rs. 2200/m^3

(iv) R.C.C. 1 : 2 : 4 roof slab cover at Rs. 3000/m^3

(v) 12mm cement plaster for sidewalls at Rs. 200/m^2

Fig.Q3

OR

4 Prepare a detailed estimate for earthwork for a portion of road from the following data:

Dist. in m	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
RL of the ground	114.50	114.75	115.25	115.20	116.10	116.85	118.00	118.25	118.10	117.80	117.75	117.90	119.50
RL of formation	115												
Gradient	Upward gradient 1 in 200						Downward gradient 1 in 400						

Formation width of road is 10m. Side slope 2:1 in banking and 1½ : 1 in cutting. Calculate also the cost of this earthwork in banking and cutting; the rates are Rs. 275/m^3 and Rs. 350/m^3. Adopt Mid-Sectional area method. **(20 Marks)**

Module-3

5 Write detailed specification for following :

(i) Earthwork excavation for foundation

(ii) Damp proof course 2.5cm (1″) C.C. 1 : 1½ : 3

(iii) Burnt brick masonry for superstructure in CM 1:6

(iv) R.C.C. 1 : 2 : 4 for roof slab. **(20 Marks)**

OR

6 Analyse rates from first principle for following :

(i) Cement concrete 1 : 5 : 10 in foundation.

(ii) Ist class brick work in super structure with CM 1:6

(iii) Coursed Rubber stone masonry in CM 1:6 for super structure.

(iv) 12 mm thick internal plastering in CM 1:6 for brick walls. **(20 Marks)**

Module-4

7 What is tender? Explain the departmental procedure of tendering civil works. **(20 Marks)**

OR

8 What are the different types of contracts? Explain any four types of contracts. **(20 Marks)**

Module-5

9 Write a short notes on :

a. Mobilization and equipment advance

b. Secured advance

c. Liquidated damages and bonus

d. Dispute resolution mechanism

e. Performance security. **(20 Marks)**

OR

10 What is valuation? Explain briefly methods of valuation of buildings. **(20 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐   **18CV72**

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Design of RCC and Steel Structures

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any ONE full question each from Module-1 and Module-2.*
2. Use of IS – 456, SP – 16, IS – 800, SP(6) and steel tables is permitted.
3. Missing data, if any, may be suitably assumed and same must be stated clearly.

Module - 1

1 Design slab type or slab beam type combined footing for two columns A and B spaced at 3.5m center to center. Cross section dimensions of column A is 400×400mm and carries an axial load of 1050kN. Cross section dimensions of column B is 500×500mm and carries an axial load of 1250kN. Safe bearing capacity of the foundation soil is 240 kN/m^2. The width of the combined footing is restricted to 2.00m. Use M-25 grade concrete and Fe-415 grade steel. Draw neat sketch of reinforcement details. **(50 Marks)**

OR

2 Design A cantilever retaining wall to retain soil embankment for a height of 3.5m above the average ground level. The back fill is horizontal at the top. The unit weight of soil is 16kN/m^2 and safe bearing capacity of the formation soil is 150 kN/m^2. The angle of repose of the soil is 30° and the coefficient of friction between concrete surface and soil may be taken as 0.55. Use M – 20 grade concrete and Fe – 415 steel. Draw a neat sketch of the designed reinforcement details. **(50 Marks)**

Module – 2

3 Design a welded gantry girder to be used in an industrial building for carrying a manually operated over head crane for the data as listed below :
Crane capacity = 200kN
Self weight of crab consisting trolley, motor, hooks, etc. = 40kN
Self weight of crane girder excluding crab (trolley) = 200kN
Minimum hook approach = 1.20m
Wheel base of crab (trolley) = 3.50m
Centre to centre distance between gantry rails = 16m(span of crane girder)
Centre to centre distance between columns = 8.00 (span for gantry girder)
Self weight of rail section = 300N/m
Diameter of crane wheel = 150mm
The steel used is Fe – 410 grade. Draw a neat sketch of the designed details. **(50 Marks)**

4. Design a bolted steel Howe truss having an effective span of 12.00m. The geometry of the truss is as shown in Fig.Q4. The forces induced in the members due to dead load, live load and wind load is tabulated in Table.Q4. Determine the design forces in the members due to various combination of loads as per IS – 800 provisions and hence design principal rafter, principal tie and main sling member with all the necessary safety checks including the reversal of stresses. Also design support joint 'A' by considering the size of supporting reinforced cement concrete column as 300×300mm, the design bearing pressure on the concrete is limited to 2N/mm^2 and the design bond stress between anchor bolt and concrete is limited to 1.2N/mm^2. Use M16 ordinary black bolts of grade 4.6 for designing member and connection with gusset plate and M25 bolt as anchor bolt at supports. List the design details.
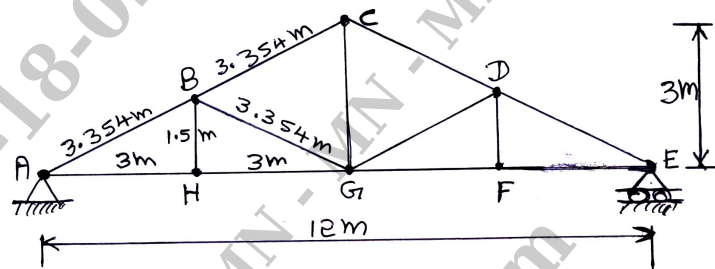

Fig.Q4

Members	Dead load kN	Live load kN	Wind load kN
Rafter AB, BC, CD and DE	–58.00	–52.52	+95.60
Tie member AH, HG, GF and FE	+52.00	+47.00	–76.00
Main sling BG, DG	+20.30	+18.40	–63.00

Table Q.4

Note :
i) (–) indicates compressive force
ii) (+) indicates tensile force
iii) Net support reaction ↑ = 45kN (at 'A')
iv) Net up-lift support reaction ↓ = 55kN (At 'A'). **(50 Marks)**

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Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Ground Water Hydraulics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a sketch, enumerate the different zones of subsurface water. **(08 Marks)**
  b. Distinguish between confined and unconfined aquifers with sketches. **(08 Marks)**
  c. Compare aquitard with aquiclude with examples. **(04 Marks)**

OR

2 a. Discuss the occurrence of water in the following:
  (i) Granite (ii) Basalt (iii) Gravel (iv) Sand (v) Clay **(10 Marks)**
  b. Highlight the salient features of the following types of aquifers (with sketches):
  (i) Perched (ii) Leaky (iii) Semi-unconfined **(10 Marks)**

Module-2

3 a. Explain the terms: (i) Specific yield (ii) Storage coefficient. How they vary with the type of soil? An artesian aquifer 20 m thick has a porosity of 20% and bulk modulus of compression 10^8 N/m^2. Estimate the storage coefficient of the aquifer, given bulk modulus of elasticity of water as 2.1×10^9 N/m^2. **(08 Marks)**
  b. Define hydraulic conductivity. Discuss the factors influencing its value. How its value is determined in the field? **(06 Marks)**
  c. A field test for permeability consists in observing the time required for tracer to travel between two observation wells. A tracer was found to take 10 hours to travel between two wells 50 m apart when the difference in the water-surface elevation in them was 0.5 m. The mean particle size of the aquifer was 2 mm and the porosity of the medium 0.3. If kinematic viscosity is 0.01 cm^2/sec, estimate:
  (i) The coefficient of permeability and intrinsic permeability of the aquifer
  (ii) The Reynold's number of flow **(06 Marks)**

OR

4 a. State and explain Darcy's law. Calculate the seepage velocity for the following data:
  Time taken for a tracer to move from one well to another 25.0 m apart = 5 hours
  Porosity of aquifer = 20%
  Head loss during the travel = 0.5 m **(08 Marks)**
  b. Distinguish between transmissibility coefficient and intrinsic permeability. Two aquifers were found to be connected by a water bearing stratum, which are 32 kms apart. The thickness of strata is 30 m which has an inclination of 20 m/km. The hydraulic gradient between the aquifer is 0.2 m/km. Determine the transmissibility of the stratum. It takes 20,000 years for the movement of ground water through the stratum. **(08 Marks)**
  c. When 3.68 million m^3 of water was pumped out from an unconfined aquifer of 6.2 km^2 areal extent, water table was observed to go down by 2.6 m. Compute the specific yield of the aquifer. If the water table of this aquifer goes up by 10.8 m, compute the volume of recharge. **(04 Marks)**

Module-3

5 a. Explain the terms cone of depression and drawdown with a sketch. **(04 Marks)**

b. Deduce the discharge equation for the steady flow to a well in a confined aquifer. **(06 Marks)**

c. A pumping test was carried out on a new irrigation bore well penetrating fully into a confined aquifer at a rate of 25 litres/sec. The drawdown measured in an observation well located at 45.7 m from the pumping well during the test is tabulated below. Compute transmissibility and storage coefficient of the aquifer by Cooper-Jacob method.

Time (in hours)	0.5	1.8	2.7	5.4	9.0	12.0	18.0	30.0	54.0
Drawdown (in mt)	0.091	0.294	0.382	0.55	0.701	0.785	0.911	1.06	1.24

(10 Marks)

OR

6 a. Discuss Chow's method of computing the transmibility and storage coefficient of an aquifer. **(06 Marks)**

b. A 0.3 m well penetrates 50 m below the static water table. After a long period of pumping at a rate of 1800 liters/minute, the drawdowns in the wells at 15 m and 45 m from the pumping well were 1.7 and 0.8 m respectively. Determine the transmissibility of the aquifer. Compute also the drawdown in the pumping well. Assume radius of influence as 300 m. **(08 Marks)**

c. Highlight the salient features of image well theory. **(06 Marks)**

Module-4

7 a. Discuss the electrical resistivity method of ground water exploration. **(10 Marks)**

b. Explain temperature logging and fluid resistivity logging with the help of simple sketches. **(10 Marks)**

OR

8 a. Explain types of radioactive logging adopted in ground water exploration with simple sketches. **(10 Marks)**

b. Discuss the seismic refraction method of ground water exploration with time-travel graph. Enumerate the applications of this method. **(10 Marks)**

Module-5

9 a. Compare and contrast the use of open wells and tube wells. **(10 Marks)**

b. List the different types of pumps used to lift the water. With a neat sketch, explain working principle of a centrifugal pump. **(10 Marks)**

OR

10 a. Explain the concept of conjunctive use of water. Enumerate the benefits accruing from it. **(10 Marks)**

b. Explain (in brief) any one method of rainwater harvesting method for :
(i) individual house (ii) multi-storeyed building. **(10 Marks)**

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18CV745

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Urban Transport Planning

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Explain system approach in Transportation Planning, with a neat flow diagram. **(10 Marks)**
   b. Explain the causes and effects of Urbanization. **(10 Marks)**

OR

2 a. Briefly explain the coordination required in Public transportation. **(10 Marks)**
   b. Write a note on : i) BRTS   ii) Metro trains. **(10 Marks)**

Module-2

3 a. Define Zoning. Discuss the points to be kept in mind while doing Zoning. **(10 Marks)**
   b. What are the methods available for origin and destination study? Explain Home Interview method in detail. **(10 Marks)**

OR

4 a. Define Expansion factor. Explain briefly the accuracy checks necessary for the data collected by any survey. **(10 Marks)**
   b. List the different sampling techniques. Explain briefly. **(10 Marks)**

Module-3

5 a. Explain in detail the various factors governing trip generation. **(10 Marks)**
   b. What is Multiple Linear Regression Analysis? Mention the assumptions and limitations of Multiple Linear Regression Analysis. **(10 Marks)**

OR

6 a. Enlist the different methods of Trip distribution. Explain in detail Average Growth Factor method and Uniform Growth Factor method. **(10 Marks)**
   b. Estimate the future trip distribution as per Furness method [upto two iterations]. The predicted future trips are given in Table Q6(b) below.

O \ D	1	2	3	4	Predicted Future Trips
1	8	3	16	15	147
2	6	9	8	5	42
3	10	8	3	8	32
4	2	4	7	12	30
Predicted Future rips	39	24	68	120	

Table Q 6(b)   **(10 Marks)**

Module-4

7 a. Explain briefly types of Opportunity models. **(10 Marks)**

b. The total number of trips produced in and attracted to three Zones A, B and C of a survey area in the design year are tabulated in Table Q7(b). It is known that the trips between two zones are inversely proportional to the second power of the travel time between zones which is uniformly 20 minutes. If the trip interchange between Zones B and C is known to be 600. Calculate the trip interchange between Zones A & B , A & C , B & A and C & B.

Zone	Trips produced	Trips attracted
A	2000	3000
B	3000	4000
C	4000	2000

Table Q7(b) **(10 Marks)**

OR

8 a. Define Modal Split. Explain in brief the factors affecting modal split. **(10 Marks)**

b. The number of trips produced in and attracted to the three Zones 1, 2 and 3 are tabulated in table Q8(b) (1) below. The order of closeness of Zones is given in table Q8(b)(2) and the Zonal 'L' factor is given in table Q8(b)(3). Distribute the trips between Zones.

Zone	1	2	3	Total
Trips produced	14	33	28	75
Trips attracted	33	28	14	75

Table Q8(b)(1)

O＼D	1	2	3
1	1	2	3
2	2	1	3
3	2	3	1

Table Q8(b)(2)

Zone	1	2	3
L factor	0.04	0.02	0.04

Table Q8(b)(3) **(10 Marks)**

Module-5

9 a. List the various assignment techniques and explain any two methods in brief. **(10 Marks)**

b. Write a flow chart of fundamental structure of Lowry model and explain the principal components of the model. **(10 Marks)**

OR

10 a. Explain Diversion Curves with limitations. **(10 Marks)**

b. Define Trip assignment Explain the application, with a neat flow chart. **(10 Marks)**

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