

Hall Ticket Number :

R-17

Code: 7G632

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Fluid Mechanics

(Civil Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

Marks

UNIT-I

1. a) Define vapour pressure, capillarity, surface tension and compressibility. 10M
 b) If the specific gravity of a liquid is 0.9, determine its mass density and specific weight. 4M

OR

2. Define total pressure and centre of pressure. Also derive the expressions for the same for an inclined immersed surface. 14M

UNIT-II

3. a) State and prove the Bernoulli's Equation. 7M
 b) A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through 45° find the magnitude and direction of the resultant force at the bend. 7M

OR

4. Given that $u = x^2 - y^2$ and $v = -2xy$, determine the stream function and potential function for the flow. 14M

UNIT-III

5. a) Explain the laws of fluid friction. 7M
 b) A pipe 50 mm diameter is 6 m long and the velocity of flow of water in the pipe is 2.4 m/s. What loss of head and the corresponding power would be saved if the central 2m length of pipe was replaced by 72 mm diameter pipe the change of section being sudden? Take $f=0.04$ for the pipes of both diameters. 7M

OR

6. The inlet and throat diameter of a Venturimeter are 0.3 m and 0.15 m, respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 137.34 kN/m², while the vacuum pressure head at the throat is 0.37 m of mercury. Find the rate of flow. Assume that 4% of the differential head is lost between the inlet and the throat. Find also the value of C_d for the Venturimeter. 14M

UNIT-IV

7. a) Derive an expression for coefficient of discharge by using venturi meter. 6M
 b) A rectangular notch of crest width 0.5 m is used to measure the flow of water in a rectangular channel 0.6m wide and 0.45m deep. If the water level in the channel is 0.225m above the weir crest, find the discharge in the channel. For the notch assume $C_d=0.63$ and take velocity of approach into account 8M

OR

8. Derive Hagen-Poiseuille equation from basics. 14M

UNIT-V

9. Explain the geometric, kinematic and dynamic similarities. 14M

OR

10. a) What is dimensional analysis? Explain Buckingham's pi theorem. 7M
 b) Explain Dimensionless numbers. 7M

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II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Strength of Materials

(Civil Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

UNIT-I

1. Derive the expression for volumetric strain of a rectangular bar subjected to three forces in mutually perpendicular directions? 14M

OR

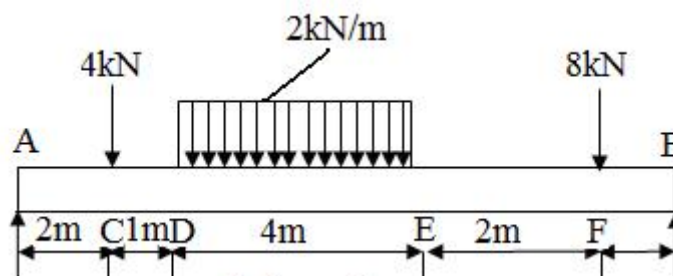
2. A cast Iron flat, 300mm long and of 30mmx50mm uniform section, is acted upon by the following forces uniformly distributed over the respective C/S 25kN in the direction of length, 350kN in the direction of width (compressive) and 200kN in the direction of thickness (tensile). Determine the change in the volume of the flat. 14M

UNIT-II

3. a) Explain different types of beams, loads and supports? 8M
b) Define shear force and Bending moment? 6M

OR

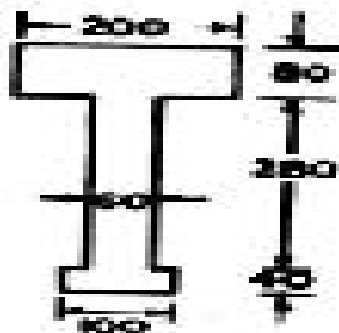
4. Draw Shear Force Diagram and Bending Moment diagram and locate the point of contra flexure for the beam shown below.

**UNIT-III**

5. A rectangular beam 300mm deep is simply supported over a span of 4m. What UDL per meter, the beam may carry if the bending stress is not to exceed 120? Take $I = 8 \times 10^6 \text{ mm}^4$. 14M

OR

6. The cross section of a cast iron machine element used as a beam is shown in the figure. The beam resists bending moment about the horizontal neutral axis. The permissible stresses in tension and compression are 50 N/mm^2 and 60 N/mm^2 . Determine the moment of resistance of the section about the horizontal N A for both positive and negative bending moments.



UNIT-IV

7. The flexural rigidity of a cantilever of span 4 m is 2×10^7 kN-m from the fixed end to a distance of 2.5 m and is 1×10^7 kN-m for the remaining part. Calculate the maximum deflection in the beam if it carries a udl of 4 kN/m over the entire span in addition to a concentrated load of 5 kN at 2.5 m from the fixed end. Use Mohr's theorems. 14M

OR

8. Write the moment area theorems and explain? Determine the deflection of a simply supported beam subjected to concentrated load W KN at its centre? 14M

UNIT-V

9. Derive the expression for maximum shear strain theory and maximum shear stress theory of failure. 14M

OR

10. A rectangular block of material subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile stress of 47 N/mm^2 , Shear stress of 63 N/mm^2 . Determine the magnitude of major and minor principal stress, maximum shear stress? 14M

Hall Ticket Number :

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Code: 7G634

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Surveying

(Civil Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

UNIT-I

1. a) What does traverse surveying mean? 7M
b) Distinguish between closed and open traverse. 7M

OR

2. A steel tape 20m long, standardized at 15°C with a pull of 12kg, was used to measure distance along a slope of 5°25'. If the mean temperature during measurement was 12°C, and the pull applied 18kg, determine the correction required per tape length. Assume coefficient of expansion as 114×10^{-7} per °C, cross-sectional area of tape = 0.08 cm², $E = 2.1 \times 10^6$ kg/cm². 14M

UNIT-II

3. The formulation width of a road is 10m and the side slopes is 2:1. The surface of the ground has a traverse slope of 1 in 10. If the depths of cutting at the centres of three sections 60m apart are 1.5, 2.5 and 2.0m respectively, determine the volume of earth work. 14M

OR

4. An excavation is to be made for a reservoir 26m long and 15m wide at the bottom, of side slope 2:1. Calculate the volume of excavation if the depth is 4m. Assume that the ground surface is level before excavation. 14M

UNIT-III

5. a) Describe the process of measuring the horizontal angle. 7M
b) Describe how you would measure vertical angles. 7M

OR

6. What is temporary adjustment of a theodolite? Describe the process of such adjustment. 14M

UNIT-IV

7. a) Discuss the methods of tacheometry. 7M
b) Explain the theory of stadia tacheometry. 7M

OR

8. a) What are the errors that may occur in plane tabling? 7M
b) What are the precautions to be taken in plane table surveying? 7M

UNIT-V

9. What are the different types of curves? Draw neat sketches of each. 14M

OR

10. A road bend which deflects by 90° is to be designed for a maximum speed of 130km/hr, a maximum centrifugal ratio of $\frac{1}{4}$, and a maximum rate of change of radial acceleration of 35cm/s³. The curve should consist of a circular arc combined with two cubic spirals. Calculate :
a. The radius of circular arc,
b. The requisite length of the transition curve, and
c. The total length of the composite curve. 14M

Code: 7GC32

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2022

Engineering Mathematics-III

(Common to All Branches)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks)

Marks

UNIT-I

1. a) Using Taylor's series method, compute the value of y at $x=0.2$ from $\frac{dy}{dx} = x + y$; $y(0) = 1$. 7M
- b) Using the bisection method, find a real root of the equation $\cos x = x e^x$ correct to three decimal places. 7M

OR

2. Solve $y' = y^2 + x$, $y(0) = 1$. Using Taylor's series Method, Compute $y(0.1)$, $y(0.2)$ and $y(0.3)$. 14M

UNIT-II

3. a) The following table of values of x and y is given.

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x=6$ 7M

- b) Using Lagrange's interpolation formula find the value of $f(10)$ from the following table

x	5	6	9	11
y	12	13	14	16

7M

OR

4. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x=1.1$ from the following table.

X	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

14M

UNIT-III

5. a) Fit a straight line $y = a + bx$ to the data by the method of least squares

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

7M

- b) Form the partial differential equation by eliminating a , b from $ax^2 + by^2 + z^2 = 1$ 7M

OR

6. a) Fit a curve $y = ae^{bx}$ to the following data by the method of least squares

x	0	1	2	3
y	1.05	2.10	3.85	8.30

7M

- b) Form a partial differential equation by eliminating the arbitrary functions from $z = f(x+at) + g(x-at)$. 7M

UNIT-IV

7. a) Express $f(x) = x$ as half range sine in $0 < x < 2$ 7M
- b) Find the Fourier series to represent $f(x) = f x$ in $0 \leq x \leq 2$ 7M

OR

8. a) Obtain the Fourier series for $f(x) = \left(\frac{f-x}{2}\right)^2$ in $0 < x < 2f$ 7M
- b) Find the half range cosine series for $f(x) = x(2-x)$ in $0 \leq x \leq 2$ and hence find prove that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} - \frac{1}{6^2} + \dots = \frac{f^2}{12}$ 7M

UNIT-V

9. a) Find the Fourier cosine transform of $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$ 7M
- b) Find the finite Fourier sine and cosine transforms of $f(x)$ defined by

$$f(x) = \begin{cases} 1, & 0 < x < \frac{f}{2} \\ -1, & \frac{f}{2} < x < f \end{cases}$$
 7M

OR

10. a) Find the Fourier sin and cosine transform of $f(x) = 2e^{-5x} + 5e^{-2x}$ 7M
- b) Find the Fourier Transform of $f(x) = \begin{cases} a^2 - x^2, & \text{if } |x| < a \\ 0 & \text{if } |x| > a > 0 \end{cases}$, and hence show that

$$\int_0^a \frac{\sin x - x \cos x}{x^3} dx = \frac{f}{4}.$$
 7M
