Hall Ticket Number :										

R-17

Code: 7G531

II B.Tech. I Semester Supplementary Examinations November 2023

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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

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			Marks
		UNIT–I	
1.	a)	Explain various types of stresses and strains.	7M
	b)	An aluminium bar 60mm diameter when subjected to an axial tensile load 100KN elongates 0.20mm in a gauge length 300mm and the diameter is decreased by 0.012mm. Calculate the modulus of elasticity and the poisson's ratio of the material.	7M
		OR	
2.	a)	Derive the relationship between young's modulus, modulus of rigidity and bulk modulus.	7M
	b)	Draw Mohr's circle when the component is subjected to mutually perpendicular tensile stresses.	7M
		UNIT–II	
3.	a)	What are the different types of beams?	5M
	b)	A cantilever of length 2 m carries a of 1 kN/m run over a length of 1.5 m from the free end. Draw the shear force and bending moment diagrams for the cantilever.	9M
		OR	
4.	a)	Define point of contra flexure.	3M
	b)	Draw the shear force and B.M diagram for a simply supported beam of length 8m and carrying a uniformly distributed load of 12KN/m for a distance of 4m from the left end. Also calculate the maximum B.M on the section.	11M
		UNIT–III	
5.	a)	Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress.	8M
	b)	Derive the section modules for (a) rectangular section and (b) circular section	6M
		OR	
6.	a)	Derive the section modules for a hollow rectangular section	4M
	b)	A timber beam 120m wide and 185mm deep supports a u.d.l of intensity w KN/m length over a span of 2.7m. If the safe stresses are 29Mpa in bending and 3Mpa in shear, calculate the safe intensity of the load which can be supported by the beam.	10M
		UNIT–IV	
7.	a)	Derive an expression for slope and deflection at free end of a cantilever beam subjected to UDL over entire span.	7M
	b)	Define Macaulay's method? And find out Deflection of a simply supported beam with an Eccentric point load	7M
		OR	
8.		A rectangular reinforced concrete simply supported beam of length 2 m and cross section 100 mm x 200 mm is carrying an uniformly distributed load of 10 kN/m through its span. Find the maximum slope and deflection. Take $E=2 \times 10^4$ N/mm^2.	14M
		UNIT–V	
9.		State and explain Lame's theory for thick cylindrical shells. Derive the Lame's equations.	14M
		OR	
10.		Determine the maximum and minimum hoop stress across the section of a pipe of 400mm internal diameter and 100 mm thick, when the pipe contains a fluid at a pressure of 8N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section.	14M

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Hall Ticket Number :										

R-17

Code: 7GC32

II B.Tech. I Semester Supplementary Examinations November 2023

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)

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Marks

UNIT–I

1. a) Find the real root of equation $x^3 - x - 11 = 0$ by bisection method. 7M

b) Using Taylor's series method, compute the value of y at x=0.2 from $\frac{dy}{dx} = x + y$; $y(0) = 1$. 7M

OR

2. Using R-K method of 4th order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$. Find $y(0.2), y(0.4)$. 14M

UNIT–II

3. a) Find the first and second derivatives of the function tabulated below at the point x = 1.5

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59.0

7M

b) Evaluate f(10) given f(x) = 168, 192, 336 at x = 1, 7, 15 respectively. Use Lagrange interpolation. 7M

OR

4. A solid of revolution is formed by rotating about the x-axis, the area between the x-axis, the lines x=0 and x=1 and a curve through the points with the following co-ordinates:

x	0.00	0.25	0.5	0.75	1.00
y	1.0000	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the soli formed using Simpsons rule. 7M

UNIT–III

5. a) Form the partial differential equation by eliminating the arbitrary constants $x^2 + y^2 + (z - c)^2 = a^2$ 7M

b) Fit a second degree parabola to the following data by the method of least squares

x	10	12	15	23	20
y	14	17	23	25	21

7M

OR

6. a) Fit a straight line $y = a + b\,x$ 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 $z = a\,x + b\,y + a^2 + b^2$ 7M

UNIT–IV

7. a) Find the Fourier series expansion for $f(x) = ® - x$ in $0 < x < 2®$ 7M

   b) Expand $f(x) = \cos x, 0 < x < ®$ in half range sine series. 7M

OR

8. Express $f(x) = x$ as half range sine and cosine in $0 < x < 2$ 14M

UNIT–V

9. a) Find the Fourier sin and cosine transform of $f(x) = \frac{e^{-ax}}{x}, a > 0$ 7M

   b) Find the Fourier cosine transform of $f(x) = e^{-ax}\,(x > 0, a > 0)$. 7M

OR

10. Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, |x| \le 1 \\ 0, |x| \ge 1 \end{cases}$.

    Hence evaluate $\int_0^{\infty} \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2}\,dx$ 14M

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