Hall Ticket Number :										

R-17

Code: 7G531

II B.Tech. I Semester Supplementary Examinations March/April 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 tensile test was conducted on a mild steel bar. The following data was obtained from the test:
   (i) Diameter of the steel bar = 3 cm
   (ii) Gauge length of the bar = 20cm
   (iii) Load at elastic limit=250kN
   (iv) Extension at a load of 150kN=0.21mm
   (v) Maximum load = 380 kN
   (vi) Total extension = 60 mm
   (vii) Diameter of rod at failure = 2.25 cm
   Determine:
   (a) The Young's modulus (b) The stress at elastic limit
   (c) The percentage of elongation (d) The percentage decrease in area. 14M

OR

2. a) Prove that the maximum stress induced in a body due to suddenly applied load is twice the stress induced when the same load is applied gradually. 7M

   b) Define the term 'composite bar'. How will you find the stresses and load carried by each member of a composite bar? 7M

UNIT–II

3. A beam ABC 8 m long has the support at the end A and other support at B 6 m from A. It carries a uniformly distributed load of 6 kN/m over the entire length and a point load of 10 kN at the end C. Draw the shear force and bending moment diagrams 14M

OR

4. A simple supported beam of length 8m rests on supports 6m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw the shear force and bending moment diagrams and find the point of contra flexure, if any? 14M

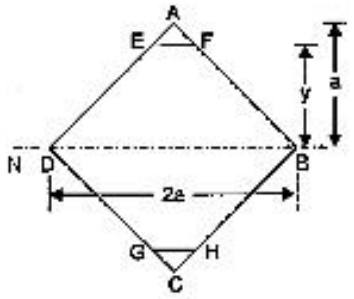
UNIT–III

5. a) Derive the section modules for (a) rectangular section and (b) circular section 7M

   b) Prove that for a rectangular section the maximum shear stress is 1.5times the average stress. Sketch the variation of shear stress. 7M

OR

6. Prove that the moment of a resistance of a beam of square section, with its diagonal in the plane of bending is increased by flatting top and bottom corners as shown in figure and that moment of resistance is maximum when $y = \frac{8a}{9}$. Find the percentage increase in moment of resistance also.



14M

UNIT–IV

7. Define Macaulay's method? And find out Deflection of a simply supported beam with an Eccentric point load 14M

OR

8. A beam of length 6 m is simply supported at the ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Compute,
   i. Slope and deflection under each load. ii. Maximum deflection
   iii. The point at which maximum deflection occurs.
   Assume E = 2 X 10^5 N/mm^2 and I = 85 X 10^6 mm^4. 14M

UNIT–V

9. A solid round bar 3 m long and 5 cm in diameter is used as a sturt. Determine the cripping load when the given sturt is used for the following conditions
   i) Both the ends are hinged
   ii) Both the ends are fixed
   iii) One end is fixed and one end is hinged and
   iv) One end is fixed and one end is free.
   Take E = 2.1 x 10^5 N/mm^2. Also find safe load taking factor of safety as 4 in each case. 14M

OR

10. What are the stresses induced in the thin cylindrical shell subjected to internal pressure? Explain and derive them. 14M

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Hall Ticket Number :										

R-17

Code: 7GC32

II B.Tech. I Semester Supplementary Examinations March/April 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. Use Milne's method to find $y(0.3)$ from $y' = x^2 + y^2$ $y(0) = 1$. Find the intial values $y(-0.1)$, $y(0.1)$, $y(0.2)$ from the Taylors series method. 14M

OR

2. Find a real root of the equation $3x = \cos x + 1$ by Newton-Raphson's method correct to four decimal places. 14M

UNIT–II

3. 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 14M

OR

4. Estimate the value of $f(22)$ and $f(42)$ from the following table by Newton's forward and backward interpolation formula. 14M

x	20	25	30	35	40	45
y	354	332	291	260	231	204

UNIT–III

5. Form a partial differential equation by eliminating the arbitrary functions $f(x)$ and $g(y)$ from $z = y\,f(x) + x\,g(y)$. 14M

OR

6. Solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$ 14M

UNIT–IV

7. Find the Fourier series to represent $f(x) = |x|$ when $-® < x < ®$ and deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{®^2}{8}$ 14M

OR

8. Find the half range cosine series for the function $f(x) = x$, when $0 < x < ®$ hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{®^2}{8}$ 14M

UNIT–V

9. If $F(s)$ is the complex Fourier transform of $f(x)$ then prove that $F\{f(ax)\} = \frac{1}{a}F\left(\frac{s}{a}\right), a \neq 0$ 14M

OR

10. Find the Fourier transform of $e^{-|x|}$. Hence show that $\int_0^\infty \frac{x \sin mx}{1+x^2}\,dx = \frac{®}{2}e^{-m}, m > 0$ 14M

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