PRN:		Course Code :	UCE 303

Second Year **B. Tech** End Semester Examination Winter 2024

Structural Mechanics

000128

Day and Date: Wed 27 NOV 2024 Max Marks: **100**

Time: 10.30AM To 01.30PM Duration: **03** hrs

Instructions:
1) Figures to the right indicate full mark.
2) Use of Non-Programmable calculator is allowed.
3) Assume any suitable data, if required and state it clearly.

			Marks	Bloom's Level	CO
Q.1		**Solve the following**			
	a)	Explain the following 1. Shear Stress 2. Pure Bending 3. Young Modulus	06	L2	1
	b)	A Square RCC column 300 mm X 300 mm in cross section is reinforced with 4 bars of 20 mm diameter. Determine the load carrying capacity of column if allowable stress in concrete is 7 MPa and allowable stress in steel is 140 MPa. Modular ratio m= 13. OR	10	L3	1
	c)	A hollow steel tube 3.5 m long has external diameter of 120 mm. The tube was subjected to a tensile load of 400 kN and extension was measured to be 2 mm. If the modulus of elasticity for the material is 200 GPa, Determine the internal diameter of the tube.	10	L3	1
Q.2		**Solve the following**			1
	a)	Explain the following 1. Point of contraflexure 2. Bending Moment Diagram	06	L2	1
	b)	A simply supported beam subjected to point load at centre of a span of beam L. Draw SFD and BMD.	10	L3	1
		OR			
	c)	A cantilever beam subjected to UDL on entire span. Draw SFD and BMD.	10	L3	1
Q.3.		**Solve the following**			
	a)	Explain the following 1. Moment of Inertia 2. Section Modulus 3. Neutral Axis	08	L2	2

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	b)	A beam simply supported at its ends has a span of 4 m and carries uniformly distributed load of 2 kN/m over the entire span. The cross section of beam is T- section having flange 150 mm X 50 mm, web thickness 50 mm and overall depth 200mm. Calculate the extreme fibre bending stress OR	10	L3	2
	c)	Derive the relation between moment of resistance and radius of curvature.	10	L3	2
Q.4.		**Solve the following**			
	a)	Derive and draw shear stress distribution across the rectangular section	08	L3	2
	b)	A rectangular section 100 mm wide and 250 mm deep is subjected to shear force of 100 Kn. What is the average and maximum shear stress in the beam section? Where does the maximum shear stress occur within the section? OR	10	L3	2
	c)	A two wooden plank 200 mm x 50 mm each are connected to form a T Section of a beam is subjected to a vertical shear force of 100kN. Calculate the shear stress at important points and stress distribution diagram. Take moment of inertia about the horizontal neutral axis is 113.4×10^6 mm^4.	10	L3	2
Q.5.		**Solve the following**			
	a)	Explain the following 1. Stress due to gradual loading 2. Stress due to sudden loading 3. Stress due to impact loading	06	L2	3
	b)	A load of 500 N falls freely through a height of 150mm on to a collar attached to a end of a vertical rod of 50 mm dia. and 2m long. Calculate maximum instantaneous extension of the rod. Also calculate maximum stress. Take $E = 2 \times 10^5$ N/mm^2	10	L3	3
Q.6.		**Solve the following**			
	a)	Explain limit of eccentricity for a rectangle section.	06	L2	4
	b)	A rectangular column section 400 mm wide and 300 mm is carrying a vertical load of 100 kN at an eccentricity of 50 mm in a plane bisecting the thickness. Determine minimum and maximum intensities of stress in the section.	10	L3	4
		OR			
	c)	A rectangular masonry pier is 4m X 3 m supports a vertical load of 50 kN as shown in figure below. Determine the stresses developed at each corner of the pier.	10	L3	4

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