U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

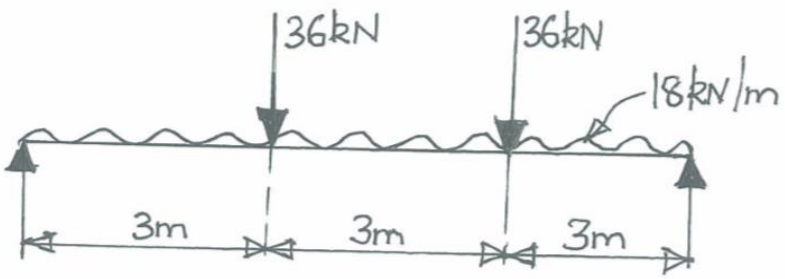
Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 19CV3PCSOM **Max Marks: 100**
Course: STRENGTH OF MATERIALS

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Explain in detail all salient features of stress-strain diagram for a mild steel specimen subjected to tension test.	*CO* 1	*PO1*	**10**
	b)		A block of size 250mmX250mmX50mm is subjected to tensile normal loads on all of its faces having equal magnitude of 500kN. (i) Calculate the strain in all directions, (ii)change in volume and modulus of elasticity of the block if E=$2X10^5$ N/mm^2 and Poisson' s Ratio =0.25.	*CO* 1	*PO1, 2*	**10**
			OR			
2	a)		Explain the concept of thermal stress. Define what is thermal strain. Explain with respect to thermal stress when a steel bar having a rectangular cross section when exposed to temperature (i) When the bar is free to expand without any restraints at both ends.; (ii) When the bar is restrained at both its ends;(iii) when the bar is retrained partially restrained at both ends.	*CO* 1	*PO1*	**10**
	b)		For a plane element subjected to a compound system of stresses, derive the expressions for the principal stresses	*CO* 1	*PO1*	**10**
			UNIT - II			
3	a)		Draw the bending moment and shear force diagram for the beam shown in figure1  Figure 1	*CO* 2	*PO2*	**10**
	b)		Draw the bending moment and shear force diagram for a cantilever beam having a span 'L' subjected to a uniformly distributed load w kN/m acting over the entire span of the cantilever beam.	*CO* 2	*PO1*	**10**

			UNIT - III			
	4	a)	Derive the bending equation for a beam that is simply supported subjected to arbitrary loading.	*CO* 2	*PO1*	**10**
		b)	A simply supported beam having a span of 3m and having a hollow rectangular cross section of 120mmx180mm (outer dimensions) and 60mmx90mm (inner dimensions) is subjected to a uniformly distributed load of 10kN/m . Determine the maximum bending stress in the beam and sketch the bending stress distribution .Consider E = 200GPa.	*CO* 2	*PO2*	**10**
			OR			
	5	a)	For a beam having a rectangular cross section show the maximum shear stress developed at the neutral surface is 1.5ζavg.	*CO* 2	*PO1*	**10**
		b)	For a beam having a typical I- section evaluate the shear stress distribution across the entire cross section.	*CO* 2	*PO1*	**10**
			UNIT - IV			
	6	a)	Deduce the Euler's equation for a column having both ends hinged.	*CO* 2	*PO1*	**10**
		b)	Explain: (i) Slenderness ratio, (ii) Long column, (iii) radius of gyration, (iv) Crippling load	*CO* 2	*PO1*	**4**
		c)	A column having a height of 3m has a square cross section of 60mmx60mm. Considering the factor of safety as 4.0, determine the safe load for the end conditions both ends of the column are hinged Consider E= 210GPa for the material of the column.	*CO* 2	*PO2*	**6**
			UNIT - V			
	7	a)	As solid shaft has to transmit 120kW of power @ 160rpm. If the shear stress is not to exceed 60Mpa and twist in a length of 3m must not exceed 1^{o}, find suitable diameter of shaft. Take G=80Gpa	*CO* 2	*PO2*	**10**
		b)	Define : (i) Thick cylinder, (ii) Thin cylinder , (iii) Longitudinal stress, (iv) hoop stress	*CO* 2	*PO1*	**4**
		c)	With neat sketches and expressions explain (i) Longitudinal stress and (ii) Circumferential stresses in thin cylinders.	*CO* 2	*PO1*	**6**

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