C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 54103

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

Civil Engineering

15UCE403-MECHANICS OF SOLIDS - II

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

PART A - (5 x 1 = 5 Marks)

1. The energy stored in a beam of length L subjected to a constant B.M. is CO1-R

   (a) $M^2L/2EI$ (b) ML/2EI (c) 2 ML/2EI (d) M^2L/EI

2. The deflection due to couple M at the free end of a cantilever length L is (Remember) CO2-R

   (a) ML/EI (b) 2ML/EI (c) ML/2EI (d) $ML^2/2EI$

3. The ratio of the maximum deflections of a beam simply supported at its ends with an isolated central load and that of with a uniformly distributed load over its entire length, is CO3-R

   (a) 1 (b) 15/24 (c) 24/15 (d) 2/3

4. If the effective length of a column is twice the actual length, then the column is (Remember) CO4-R

   (a) Fixed at both ends

   (b) Hinged at both ends

   (c) Fixed at one end and free at the other end

   (d) Fixed at one end and hinged at the other end

5. In cantilever beam, slope and deflection at free end is CO5-R

   (a) Zero (b) Maximum (c) Minimum (d) 10

PART – B (5 x 3= 15Marks)

6. State Castinglianos theorem. CO1-R

7. Define Macaulay's methods. CO2-R

8.		Define propped cantilever beam.	CO3-R	
9.		Distinguish between long column and short column.	CO4-R	
10.		Write the conditions for unsymmetrical bending.	CO5-R	

PART – C (5 x 16= 80Marks)

11.	(a)	Using castigliano's theorem , calculate the vertical deflection at the middle of a simply supported beam which carries a uniformly distributed load of intensity W over the full span. The flexural rigidity EI of the beam is constant and only strain energy of bending is to be considered.	CO1-App	(16)
		Or		
	(b)	Find the maximum deflection due to point load at the free end of a elastic cantilever beam of a rectangular cross section considering flexural and shearing deformations.	CO1-App	(16)
12.	(a)	A horizontal beam of uniform section and 6m long is simply supported at its ends. Two vertical concentrated loads of 48KN and 40KN acts at 1m and 3m resp. from the left hand support. Determine the position and magnitude of the maximum deflection , using Macaulay's method, if E – 200GN/m^2, and I = 85x10^{-6} m^4	CO2-App	(16)
		Or		
	(b)	A cantilever beam of length 2a is carrying a load of W at the free end and another load of W at its centre . Determine the slope and deflection of the cantilever beam at the free end using Conjugate beam method.	CO2-App	(16)
13.	(a)	A continuous beam ABC of constant moment of inertia is simply supported at A,B and C. The beam carries a central point load of 4 KN in a span AB and central clockwise moment of 30 KN m in span BC. span BC is 15 m. Draw the Bending moment diagram.	CO3-App	(16)
		Or		
	(b)	Propped cantilever of span 6m having the prop at the end is subjected to two concentrated loads of 24 KN and 48 KN at one third point respectively from left fixed end support. Draw the shear force and bending moment diagram.	CO3-App	(16)
14.	(a)	Derive the expression to find the buckling load of a long column fixed at both ends.	CO4-U	(16)

Or

	(b)	A Load of 75 KN is carried by a column made of cast iron. The external and internal diameters are 200 mm and 180 mm respectively. If the eccentricity of the load is 35 mm. Find i) The maximum and minimum stress intensities. ii) Up to what eccentricity there is no tensile stress in the column.	CO4-App	(16)
15.	(a)	A curved beam of rectangular cross section initially unstressed is subjected to a bending moment of 1500NM, which leads to straighten the bar. The section is 4cm wide and 5cm deep in the plane of bending and mean radius of curvature is 10cm. Find the position of neutral; axis and the best bending stress.	CO5-App	(16)

Or

	(b)	A ring is made up of steel bar 30mm diameter and the mean radius of the ring is 180mm. Calculate the maximum tensile stress and compressive stress in the material of the ring, if it is subjected to a pull of 12KN. .	CO5-App	(16)

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