Q.P. Code: 18CE0103 **R18**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year I Semester Supplementary Examinations December-2021

INTRODUCTION TO SOLID MECHANICS

(Civil Engineering)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

1	a	Define: Bulk-modulus and Poisson's Ratio.	**2M**
	b	Write down the bending stress equation.	**2M**
	c	State the assumptions while deriving the general formula for shear stresses.	**2M**
	d	What is the relation between slope, deflection and radius of curvature of a beam?	**2M**
	e	What are the different modes of failures of a column?	**2M**

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

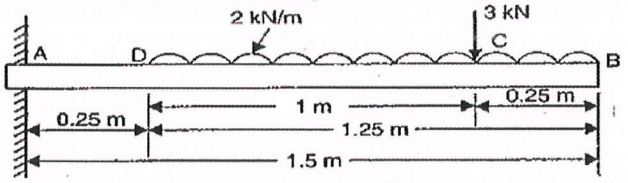
2 The normal stress in two mutually perpendicular directions are 600N/mm^2 and 300N/mm^2 both tensile. The complimentary shear stresses in these directions are of intensity 450 N/mm^2. Find the normal, tangential stresses on the two planes which are equally inclined to the planes carrying the normal stresses mentioned above. **10M**

OR

3 A steel bar 50 mm wide, 12 mm thick and 300 mm long is subjected to an axial pull of 84 kN. Find the changes in the length, width, thickness and the volume of the bar. **10M**

UNIT-II

4 Draw the shear force and bending moment diagram for the cantilever beam shown in figure. **10M**



OR

5 A beam is simply supported and carries a uniformly distributed load of 40KN/m run over the wholespan. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is 7 x 10 ^{8}mm^4, find thespan of the beam. **10M**

UNIT-III

6 A hollow shaft is to transmit 300kW power at 80 rpm. If the shear stress is not exceed 60 N/mm^2 and the internal diameter is 0.6 of the external diameter. Find the external and internal diametersassuming that the maximum torque is 1.4 times the mean. **10M**

OR

7 A simply supported beam carries a uniformly distributed load of intensity 30 N/mm over the entire span of 2 m. The cross section of beam is a T-section having flange 125 x 25 mm and web 175 x 25 mm. Calculate the maximum shear stress for the section subjected to maximum shear force. Also draw the shear stress distribution. **10M**

UNIT-IV

8 A beam 6 m long, simply supported at its ends, is carrying a point load of 50 kN at its center. The moment of inertia of the beam is given as equal to 78 x 10^6 mm^4 and. If E for the material of the beam = 2.1 x 10^5 N/mm^2, calculate: **10M**
(i) deflection at the centre of the beam and (ii) slope at the supports.

OR

9	A simply supported beam carries a UDL of 20 kN/m over its span of 8 m. Determine the slope at the ends and the deflection at mid span by moment area method if E = 200 G N/m^2 and I= 30,000cm^4.	**10M**

UNIT-V

10	A rectangular column of wood, 3 m long, carries a load of 300 kN. Determine whether or not a section of size 200 mm x 150 mm will be able to carry this load if a factor of safety of 3 is to be used, assuming Euler's formula is applicable. E = 12.5 GPa and the permissible stress is 12 MPa. If this section will not be able to carry this load, design a square section to do so.	**10M**

OR

11	**a**	Determine the crippling load on a column when both ends of columns are hinged.	**5M**
	b	An angular section 240 x 120 x 20 mm is used as 6 m long column with both ends are fixed. What is the crippling load for the column? Take E = 210 GPa.	**5M**

END