Q.P. Code: 20CE0164 **R20**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B. Tech II Year I Semester Supplementary Examinations November-2022

MECHANICS OF SOLIDS

(Common to ME & AGE)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	State Hooke's law with equation.	L1	2 M
	b	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 = 20 cm (iii) Load at elastic limit = 250 KN (iv) Extension at a load of 150 KN = 0.21 mm (v) Maximum load = 380 KN (vi) Total extension = 60 mm (vii) Diameter of the rod at the failure = 2.25 cm. Determine : (i) The Young's modulus, (ii) The stress at elastic limit, (iii) The percentage elongation, and (iv) The percentage decrease in area.	L3	10 M

OR

2	a	Define Bulk Modulus and Poisson's Ratio.	L1	4 M
	b	A steel tube of 30 mm external diameter and.20 mm internal diameter encloses a copper rod of 15 mm diameter to which it is rigidly joined at each end. If, at a temperature of 10°C there is no longitudinal stress, calculate the stresses in the rod and tube when the temperature is raised to 200°C. Take E for steel and copper as 2.1 x 10^5 N/ mm^2 and 1 x 10^5 N/mm2 respectively. The value of co-efficient of linear expansion for steel and copper is given as 11 x 10-6 per °C and 18 x 10-6 per °C respectively.	L3	8 M

UNIT-II

3		Simply supported beam of length 5 m carries a uniformly increasing load of 800 N/m at one end to 1600 N/m run at the other end. Draw SFD and BMD for the beam. And also calculate the position and magnitude of maximum bending moment.	L3	12 M

OR

4	a	Derive the simple bending equation.	L2	8 M
	b	State the assumptions made in the theory of simple bending.	L2	4 M

UNIT-III

5	a	Derive shear stress distribution formula for circular section with a neat sketch.	L1	6 M
	b	A circular beam of 100 mm diameter is subjected to a shear force of 5KN. Calculate: (i) Average shear stress (ii) Maximum shear stress (iii) Shear stress at a distance of 40 mm from N.A.	L3	6 M

OR

6	A hollow shaft, having an inside diameter 60% of its outer diameter, is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in material, if the material to be used is also the same.	L3	12 M

UNIT-IV

7	A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire span of 5 m. If the value of E for the beam material is 1 x 10^4 N/mm^2, find : (i) The slope at the supports and (ii) Maximum deflection.	L3	12 M

OR

	a	Write the assumptions made in the Euler's column theory.	L2	4 M
8	b	Write the end conditions for long columns and state the difference between long columns and short columns.	L2	8 M

UNIT-V

9	A copper cylinder, 90 cm long, 40 cm external diameter and wall thickness 6 mm has its both ends closed by rigid blank flanges. It is initially full of oil at atmospheric pressure. Calculate additional volume of oil which must be pumped into it in order to raise the oil pressure to 5 N/mm^2 above atmospheric pressure. For copper assume E= 1.0 x 10^5 N/mm2and Poisson's ratio 1/3. Take bulk modulus of oil as K= 2.6 x 10^3N/mm	L3	12 M

OR

10	A steel cylinder of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking, the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm^2. Find the original difference in radii at the junction. Take E = 2 x 10^5 N/mm^2.	L3	12 M

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