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

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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech II Year I Semester Regular Examinations Nov/ Dec 2019
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 principal stresses and principal planes.
(b) Write the simple bending formula and explain each letter.
(c) Draw the shear stress distribution for a rectangular section.
(d)What is relation between slope, deflection and radius of curvature of a beam?
(e)What are the different modes of failures of a column?

PART-B

Answer all five units. **5 X 10 = 50 Marks**

UNIT-I

2) A steel bar 50mm wide, 13mm thick and 500 mm long is subjected to an axial pull of 100 KN. Find the changes in length,width,thickness and the volume of the bar. The poisons ratio value is 0.25.

(OR)

3) The normal stress in two mutually perpendicular directions is 600 N/mm^2 and 400 N/mm^2 both are tensile. The complimentary shear stress in these directions is of 300 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.

UNIT-II

4) A beam is simply supported and carries a uniformly distributed load of 50 KN/mm run over the whole span. The section of the beam is rectangular having depth as 600 mm. If the maximum stress in the material of the beam is 140 N/mm^2 and moment of inertia of the section is 7 X 10^8 mm^4, find the span of the beam.

(OR)

5) Derive the bending equation M/I = f/y = E/R.

UNIT-III

6) A solid circular shaft transmits 80 KW power at 180 rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1º in 3 m length of shaft, and shear stress is limited to 40 N/mm^2. Take modulus of rigidity is 1 X 10^5 N/mm^2.

(OR)

7) A rectangular beam 150 mm wide and 300 mm deep is subjected to a maximum shear force of 40 KN. Determine (i) average shear stress (ii) maximum shear stress.

UNIT-IV

8) A beam 6 m long, simply supported at its end, is carrying a point load of 60 KN at its center. The M.I of the beam is 75 X 10^6 mm^4; E is 2.0 X 10^5 N/mm^2. Calculate deflection of the beam at center and slope at supports.

(OR)

9) A simply supported beam carries a UDL of 30 KN/m over its entire span of 6 m. Determine the slope at the ends and deflection at its center.

UNIT-V

10) Determine the Euler critical load for the column section having T-shape, flange 150 mm X 20 mm and web 140 mm X 20 mm. The length of the column is 4 m, the ends of column are both hinged in one case and another case is fixed. Take E is 2.0 X 10^5 N/mm^2.

(OR)

11) (a) What are the assumptions made in Euler theory.
(b) Define the term column and what are the types of columns?
(c) Write the effective length formulas for columns based on end conditions.

END