Q.P. Code: 19CE0102 **R19**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

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

STRENGTH OF MATERIALS - I

(Civil Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 **a** A hollow cast iron cylinder 4 m long, 300 mm outer diameter, and thickness of metal 50 mm is subjected to a central load on the top when standing straight. The stress produced is 75 x 10^3 kN/m^2. Assume Young's Modulus for cast iron as 1.5 x 108 kN/m^2 and find (i) magnitude of load (ii) longitudinal strain produced, and (iii) total decrease in length. **6M**

b A bar of 20 mm diameter is tested in tension. It is observed that when a load of 37.7 kN is applied, the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0036 mm. find the Poison's ration, Yong's modulus, bulk modulus of elasticity and modulus of rigidity. **6M**

OR

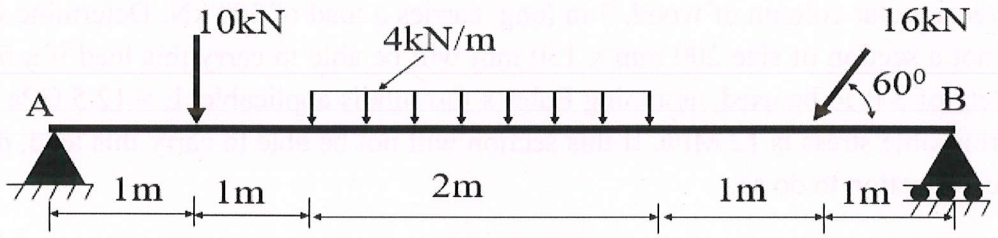
2 Obtain an expression for the major and minor principal stresses on a plane, when the body is subjected to direct stresses in two mutually perpendicular directions accompanied by a shear stress. **12M**

UNIT-II

3 A 10 m long simply supported beam carries two points loads of 10 kN and 6 kN at 2 m and 9 m respectively form the left end. It has also a uniformly distributed load of 4 kN/m run for the length between 4 m and 7 m from the left end. Draw shear force and bending moment diagrams. **12M**

OR

4 A simply supported beam is shown in the figure. Draw the shear force and bending moment diagrams for the loads shown in figure. **12M**

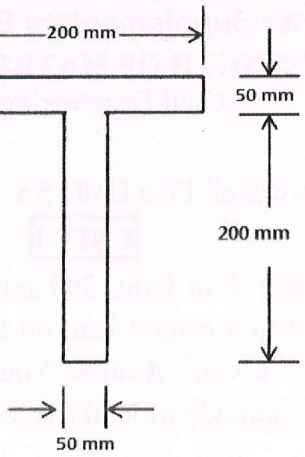


UNIT-III

5 List the assumptions made in deriving the flexure formula. Derive the equation M/I = σ/y = E/R. **12M**

OR

6 A T-shaped cross section of a beam shown in Figure below is subjected to a vertical shear force of 100 kN. Calculate the shear stress at important points and draw shear stress diagram. Moment of inertia about the horizontal neutral axis is 113.4×10^6 mm^4. **12M**



UNIT-IV

7 A timber beam of rectangular section has a span of 4.8 m and is simply supported at its ends. It is required to carry a total load of 45kN uniformly distributed over the whole span. Find the value of the breadth (b) and depth (d) of the beam, if maximum bending stress is not to exceed 7 Mpa and maximum deflection is limited to 9.5 mm. Take E for the timber as 10.5 GPa. **12M**

OR

8 A cantilever of length 6 m carries a uniformly distributed load of 10 kN/m over the whole length. If $E = 200 \times 10^6$ kN/m^2 and $I = 30 \times 10^{-5}$ m^4, determine the following, using conjugate beam method: **12M**
(i) Slope at the free end
(ii) Deflection at the free end

UNIT-V

9 Two steel struts have the same cross-sectional areas. One is a solid and the other is a hallow with internal diameter three-fourth of the external diameter. Compare the ratio of the strength of the solid steel struct to that of the hallow one. **12M**

OR

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. **12M**

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