Question Paper Code: 16CE111 **R16**

Hall Ticket No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR
(AUTONOMOUS)
B.Tech II Year II Semester Supplementary Examinations, December 2018

STRENGTH OF MATERIALS - II

(Civil Engineering)

Time: 3Hrs **Max Marks: 60**

Answer all Five Units 5 X 12 = 60 Marks

UNIT - I

1 Explain in detail the maximum principal stress and maximum principal strain theories. Using these two theories, design the diameter of the solid shaft given, bending moment = 7 kN.m, twisting moment = 20 kN.m, yield strength = 200 MN/m^2, E = 2 x 10 ^{6} N/mm^2, Poisson's ratio = 0.3, factor of safety = 2. 12 M

OR

2 At a point in a strained material, the principal stresses are 100 MN/m^2 (tensile) and 40 MN/m^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60^o to the axis of major principal stress. What is the resultant stress and maximum intensity of shear stress in the material at a point? 12M

UNIT - II

3 a. How do you go about the design of thin cylindrical shells? 5M

b. A cylindrical shell is 3 m long, 0.75 m internal diameter and 12.5 mm thickness. Calculate the change in diameter of the shell if it is subjected to an internal pressure of 1.5 N/mm^2. Also calculate the maximum shear stress induced in the shell. Given that E = 200 GPa and Poisson's ratio = 0.25. 7M

OR

4 a. How hoop stress in thick cylinders can be effectively reduced? 3M

b. A compound cylinder is made by shrinking a cylinder of 200 mm external diameter and 160 mm internal diameter over another cylinder of 160 mm external diameter and 120 mm internal diameter. The radial pressure at the junction after shrinking on is 8 N/mm^2. Estimate the final stresses setup across the section when the compound cylinder is subjected to an internal fluid pressure of 60 N/mm^2. 9M

UNIT - III

5 a. Draw the stress distribution diagram in case of an eccentrically loaded column. 3M

b. A masonry dam 8 m high, 1.5 m wide at the top and 4 m wide at the base has its water face vertical and retains water to a depth of 6 m. Find the maximum and minimum stress intensities at the base. The density of water is 9.81 kN/m^3 and that of masonry is 22 kN/m^3. 9M

OR

6 a. A laminated spring 1 m long is made up of plates each 50 mm wide and 10 mm thick. If the bending stress in the plates is limited to 100 MN/m^2, how many plates would be required to enable the spring to carry a central point load of 2 kN. If E = 200 GN/m^2 what is the deflection under the given load of 2 kN. 6M

b. An open coiled helical spring made from wire of circular cross section is required to carry a load of 100 N. the wire diameter is 8 mm and mean coil radius is 40 mm. If the helix angle of the spring is 30^o and the number of turns is 12, calculate (i) axial deflection, (ii) angular rotation of free end with respect to the fixed end of the spring. 6M

UNIT - IV

7 a. Derive the expression for Euler's buckling load of a long column hinged at both ends. 6M

b. A hollow cylindrical cast iron column is 4 m long, both ends being fixed. Design the column to carry an axial load of 250 kN. Use Rankine's formula and adopt a factor of safety 3. The internal diameter may be taken as 0.8 times the external diameter. Take $F_c = 550$ N/mm^2 and $\alpha = 1/1600$. 6M

OR

8 a. Distinguish between short column and long column. 4M

b. A hollow cast iron column whose outside diameter is 200 mm has a thickness of 20 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 4. Calculate the slenderness ratio and ratio of Euler's and Rankine's critical loads. $F_c = 550$ N/mm^2 and $\alpha = 1/1600$ and $E = 8 \times 10^4$ N/mm^2. 8M

UNIT - V

9 A beam of T-section (flange 120 mm x 20 mm, wed 180 mm x 20 mm) is 3 m in length and is simply supported at the ends. It carries a load of 3 kN inclined at 15^o to the vertical and passing through the centroid of the section. If E = 200 GN/m^2, determine the maximum tensile stress and deflection due to the load. 12 M

OR

10 Derive the expression for bending stress in curved bars subjected to bending moment. 12 M

END