R16

Reg. No: [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech II Year I Semester Supplementary Examinations August-2022
STENGTH OF MATERIALS
(Common to ME & AGE)

Time: 3 hours   Max. Marks: 60

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

UNIT-I

1   A steel rod of 3 cm diameter is enclosed centrally in a hollow copper tube of external diameter 5 cm and internal diameter of 4cm. the composite bar is then subjected to an axial pull of 45000N. if the length of each bar is equal to 15 cm, determine: i) The stresses in the rod and tube, and (ii) Load carried by each bar.   **12M**

OR

2   Derive the relation between the three elastic constants E, C and K.   **12M**

UNIT-II

3   **a**   A cantilever of length 3 m carries a uniformly distributed load of 1.5 KN/m run over a length of 2 m from the free end.   **6M**
    b   Define beam. Sketch different types of beams, types of supports and types of loads indicating their names.   **6M**

OR

4   **a**   Simply supported beam of length 6 m carries a uniformly increasing load of 600 N/m at one end to 1500 N/m run at the other end. Draw SFD and BMD for the beam.   **6M**
    b   Draw the shearing force and bending moment diagrams for the beam shown in figure   **6M**
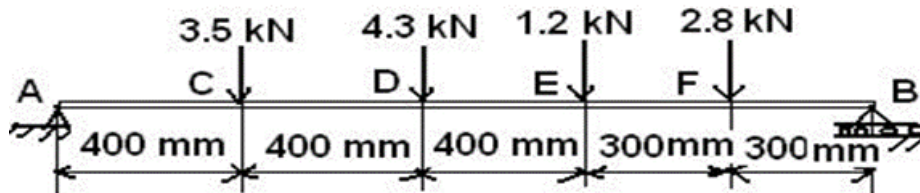
UNIT-III

5   **a**   Derive the simple bending equation stating the assumptions made.   **6M**
    b   A steel beam of I –section, 200 mm deep and 160 mm wide has 16 mm thick flanges and 10 m thick web. The beam is subjected to a shear force of 200 KN. Determine the shear stress distribution over the beam section.   **6M**

OR

6   **a**   Define section modulus Derive the section modulus for hollow circular cross section.   **6M**
    b   A timber beam 120 mm wide and 200 mm deep is simply supported over a span of 4 m. The beam carries a UDL of 2.8 KN/m over the entire length. Find the maximum bending stress induced. Plot the bending stress distribution at the quarter span cross section of the beam.   **6M**

UNIT-IV

7   A cantilever of length 4 m carries a uniformly distributed load 3 KN/m over a length of 1.5 m from the free end and a point load of 2 KN at the free end. Find the slope and deflection at the free end if $E = 2.1 \times 10^5$ N/mm^2 and $I = 6.667 \times 10^7$ mm4.   **12M**

OR

8 A hollow shaft is 1 m long and has external diameter 50 mm. It has 20 mm internal diameter for a part of length and 30 mm for the rest of the length. If the maximum shear stress in it is not exceed 80 N/mm2, determine the maximum power transmitted by it at a speed of 300 r.p.m. If the twists produced in the two portions of the shafts are equal. Find the lengths of the two portions.   **12M**

UNIT-V

9 A cylindrical vessel, whose ends are closed by means of rigid flange plates, is made of steel plate 3 mm thick. The length and the internal diameter of the vessel are 50 cm and 25 cm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 3 N/mm^2. Also calculate the increase in length, diameter and volume of the vessel. Take E as 2×10^5 N/mm^2 and Poisson's ratio 0.3.   **12M**

OR

10 Derive the expression for stresses developed in a compound thick cylinder.   **12M**

*** END ***