Total number of printed pages: 02

D/Semester 3rd /DCE 303

2023

Strength of materials

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) A brass bar, having cross sectional area of 500 mm^2 is subjected to axial forces as shown in the fig 1. Find total elongation of the bar. Take E = 80 GPa. 12

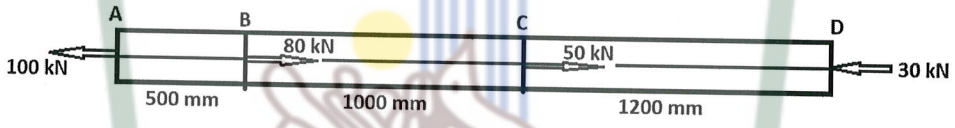

Fig 1.

b) A solid circular shaft of 100 mm diameter is transmitting 120 kW at 150 r.p.m. find the intensity of shear stress in the shaft. 8

2. a) The stresses at a point of a machine component are 150 MPa and 50 MPa both tensile. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of 55^0 with the principal stress. Also write the steps of construction. (Use Mohr's circle) 14

b) A point in a strained material is subjected to two mutually perpendicular tensile stresses of 200 MPa and 100 MPa. Determine the intensities of normal, shear and resultant stresses on a plane inclined at 30^0 with the axis of minor tensile stresses.(Use analytical method) 6

3. a) With the help of a beam show the condition of pure bending. 3

b) With the help of a suitable diagram explain the stress distribution across a symmetrical rectangular section. 5

c) Give the practical application of bending equation. 3

d) Define section modulus and derive the expression for section modulus of rectangular section. 2+3

e) A steel wire of 5mm diameter is bent into a circular shape of 5m radius. 4

Determine the maximum stress induced in the wire. Take E = 200 GPa.

4 a) In an experiment, a bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on length of 200 mm is 0.09 mm and change in diameter is 0.0039 mm. calculate, 10

i) Poisson's ratio

ii) Young's modulus

iii) Modulus of rigidity.

b) Find the angle of twist per meter length of a hollow shaft of 100 mm external and 60 mm internal diameter, if the shear stress is not to exceed 35 MPa. Take C = 85 GPa. 10

5. a) A steel plate of width 100 mm and thickness 40 mm is bent into a circular arc of radius 10m. Determine the maximum stress induced and the bending moment which will produce the maximum stress. Take E = 2 x 10^5 N/mm^2. 10

b) A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 4m. If the beam is subjected to a uniformly distributed load of 4.5 kN/m, find the maximum bending stress induced in the beam. 10

6 Calculate and draw the Shear force and bending moment diagram for the following beam shown in fig 2. 20

Fig 2.

7 An over hanging beam ABC is loaded as shown in fig 3. Draw the shear force and bending moment diagrams and find the point of contraflexure, if any. 20

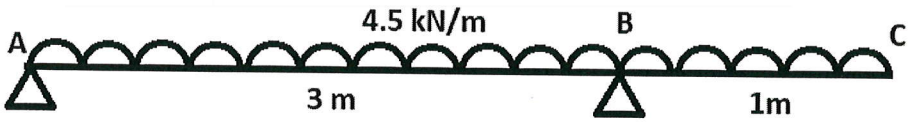

Fig 3.

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