Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)
Semester: 3rd
Name of Subject: Strength of Materials
Subject Code: PCME-102
Paper ID: 16073

Time Allowed: 03 Hours   Max. Marks: 60

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A   [Marks: 02 each]

Q1.
   a) What is the principle of superposition ?

   b) What are thermal stresses ?

   c) Define point of contraflexure.

   d) What is Poisson's ratio ?

   e) Why a hollow shaft is preferred over a solid shaft?

   f) Define Shear force and give its sign conventions.

Part – B   [Marks: 04 each]

Q2. A hollow shaft of external and internal diameter of 90 mm and 60 mm is required to transmit torque from one end to the other. What is the safe torque it can transmit, if the allowable shear stress is 50 MPa ?

Q3. Prove that $T/J = f_s/R = C\theta/L$, the torsion equation.

Q4. Derive the relationship between slope, deflection and radius of curvature.

Q5. A copper wire of 4 mm diameter is required to be wound around a drum. Find the minimum radius of the drum, if the stress in the wire is not to exceed 90 MPa. Take modulus of elasticity for the copper as 200 GPa.

Q6. Draw the SF and BM diagrams for a cantilever beam of length L carrying a point load W at the free end.

Q7. Derive the relation between Modulus of rigidity and Modulus of elasticity.

P.T.O.

Part – C   [Marks: 12 each]

Q8. Write Short notes on:

a) Mohr's circles of stress and its applications.

b) Explain the term tosional rigidity and write their significance.

OR

A boiler shell of 4 m diameter is made up of mild steel plates of 30 mm thick. The efficiency of the longitudinal and circumferential joints is 90% and 70% respectively. Determine the safe pressure in the boiler, if the permissible tensile stress in the plate section through the rivets is 100 MPa. Also determine the circumferential stress in the plate and longitudinal stress through the rivets.

Q9. The stresses at a point of a machine component are 100 MPa and 80 MPa both tensile. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of 45° with the axis of major tensile stress. Also find the magnitude of the maximum shear stresses in the component.

OR

A simply supported beam 8 m long is carrying a uniformly distributed load of 15 kN/m over a length of 5 m from the right end. Draw the S.F. and B.M. diagrams for the beam and also calculate the maximum B.M. on the section.

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