[Total No. of Questions: 09] [Total No. of Pages: .....]

Uni. Roll No. .....

Program: B.Tech MORNING

Semester: 3/ (2018) 11 MAY 2023

Name of Subject: Solid Mechanics

Subject Code: PCCE-102

Paper ID: 16021

Scientific calculator is Allowed

Time Allowed: 03 Hours Max. Marks: 60

NOTE:

Parts A and B are compulsory

Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

Any missing data may be assumed appropriately

Part – A [Marks: 02 each]

Q1)

a) Define Hooke's law. Also draw stress strain curve for mild steel.
b) Draw the line diagram of propped cantilever beam.
c) List the method of analysis for statically indeterminate beams.
d) What is the difference between Column and Struts.
e) Derive the relation between E, K, G and μ.
f) Define Resilience and toughness.

Part – B [Marks: 04 each]

Q2) Draw the shear stress distribution diagram and find the maximum shear stress for T section beam having flange of 100 mm long and 20mm thick along with web of 130 mm deep and 20 mm thick.

Q3) A solid circular shaft of steel is subjected to a torque of 48kNm.If the permissible angle of twist is 0.5° per metre length of shaft. Design the suitable section of shaft if shear stresses should not exceed 90 N/ $mm^2$. Take modulus of rigidity as 84Gpa.

Q4) Calculate the value of poison's ratio and values of three moduli E,G and K for a bar of 40mm diameter subjected to a pull of 80 kN. The extension of the rod for gauge length of 200mm is 0.1mm and the change in diameter is 0.004mm.

Q5) Differentiate between ductility and Brittleness with examples.

Q6) A beam of uniform section, 10m long is simply supported at the ends. It carries point loads of 150 kN and 65kN at distances of 2.5 m and 5.5 m respectively from the left end. Calculate deflection under each load. Take E = 200GPa and I = 118* $10^{-4}$ $m^4$.

Q7) A tube of aluminium has to transmit an axial tensile load of 150 kN. The wall thickness of the tube is 10mm. Find the minimum outer diameter of the tube if the allowable tensile stress is 60N/$mm^2$.

Part – C [Marks: 12 each]

Q8) A beam AB 10 metres long has supports at its ends A and B. It carries a point load of 5 kN at 3 metres from A and a point load of 5 kN at 7 metres from A and a uniformly distributed load of 1 kN per metre between the point loads. Draw SFD and BMD of the beam.

OR

Two planes AB and BC which are at right angles carry shear stresses of intensity 17.5 N/mm$^2$ while these planes also carry a tensile stress of 70 N/mm$^2$ and a compressive stress of 35 N/mm$^2$ respectively. Determine the principal planes and principal stresses. Also determine maximum shear stress.

Q9) Enlist the effective length of columns for various end conditions. Further mention the Euler's Buckling loads for each end condition. Derive any one condition.

OR

A cast iron beam section is of I section with a top flange 80 mm * 20 mm thick, bottom flange 160 mm * 40 mm thick and the web 200 mm deep and 20 mm thick. The beam is freely supported on a span of 5 m. If the tensile stress is not to exceed 20N/mm $^2$, find the safe uniformly distributed load which the beam can carry also find the compressive stress.