R17 Regulation *Subject code: 1P3CE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech II Year I Semester Supplementary Examinations, March/April 2023

MECHANICS OF SOLIDS

(ME)

Maximum Marks: 70 Date:10.04.2023 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 State the Hooke's law.
2 Obtain an expression for strain energy stored in a body when the load is applied gradually.
3 What is point of contra flexture?
4 Derive the relation between the shear force and bending moment in a beam.
5 Mention the assumptions in the theory of simple bending.
6 Find an expression for section modulus of a rectangular section of a beam.
7 Define the terms: principal planes and principal stresses
8 Give the relationship between the deflection of a beam and (i) rate of loading (ii) shear force.
9 What is the relationship between the Hoop and longitudinal stresses in thin cylinders?
10 State the assumptions made in the theory of torsion.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 A steel rod which tapers uniformly from 5cm diameter to 3cm diameter in length of 50cm,is subjected to an axial load of 6000N.If E = 2 × 105 N/mm2 , find the extension of the rod. [10]

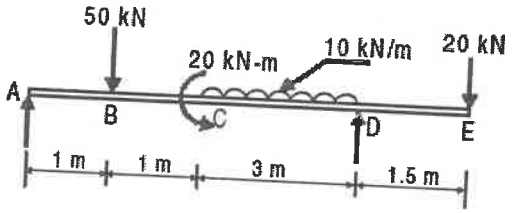
OR

12 The extension in a rectangular steel bar of length 400 mm and thickness 10 mm is found to be 0.21 mm. the bar tapers uniformly in width from 100 mm to 50 mm. if the Young's modulus is 200 GPa, determine the axial load on the bar. [10]

13 A cantilever of length 3m carries a gradually varying load, zero at the free end to 1kN/m at the fixed end .Draw the S.F.D and B.M.D for the cantilever. [10]

OR

14 Draw the shear force and bending moment diagrams for the beam loaded and supported as shown in figure . [10]



15 Derive the equation M/I = f/y = E/R. [10]

OR

16 Distribution of shearing stress over rectangular section ? [10]

17 Draw "Mohr's stress circle" for principal stresses of 80 N/mm^2 tensile and 40 N/mm^2 compressive and find the resultant stresses on planes making 25^0 and 60^0 with the major principal plane. Find also normal and tangential stresses on these planes? [10]

OR

18 A steel specimen is subjected to the following principal stresses 120 N/mm^2 (Tensile) 50 N/mm^2 (compressive). If the proportionality limit for the steel specimen is 225 N/mm^2, find the factory of safety according to:
i) Maximum principal stress theory
ii)Maximum principal strain theory
iii) Maximum shear stress theory.

19 Design a suitable diameter for a circular shaft required to transmit 90 kW at 180 rpm. The shear stress in the shaft is not to exceed 70 MPa and the maximum torque exceeds the mean by 40%. Also find the angle of twist in a length of 2 metres. Take Modulus of rigidity = 90 GPa. [10]

OR

20 A cylindrical vessel is 1.6m diameter and 5m long is closed at ends by rivets. It is subjected to an internal pressure of 4N/mm2 .If the maximum principal stress is not to exceed 120 N/mm2 , find the thickness of the shell. Assume E = 2 x 10 5 N/mm2 and Poisson's ratio = 0.25. Find the change in diameter, length and volume of the shell. [10]