R20 Regulation *Subject code: 3P3CF*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular/Supplementary Examinations, March/April 2023

MECHANICS OF SOLIDS

(MECHANICAL ENGINEERING)

Maximum Marks: 70 Date:12.04.2023 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 and explain hook's law.
2 Explain about Gradual, sudden and shock loadings?
3 Define beam? Write about the types of beams?
4 Define shear force and bending moment.
5 Mention the assumptions in the theory of simple bending.
6 Draw the Shear stress diagram for I- section.
7 Explain about Mohr's theorem?
8 What is Tresca's theory.
9 Differentiate hoop & longitudinal stress.
10 Write torsion formulae and discuss significance of all parameters.

Part-B

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

11 a) Construct stress strain diagram for structural steel and locate various important salient points on that. 7M
b) Write all the relations relating the elastic constants? 3M

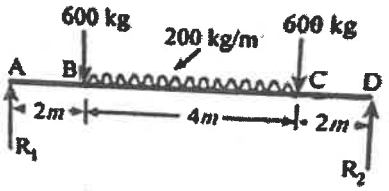
OR

12 The following data pertains to a tension test conducted in a laboratory. 10M
Diameter of the specimen = 15 mm
Length of the specimen = 200 mm
Extension under a load of 10 kN = 0.035 mm
Load at yield point = 110 kN
Maximum load = 190 kN
Length of specimen after failure = 255 mm
Neck diameter = 12.25 mm
Determine: (i) Young's Modulus (ii) Yield stress (iii) Ultimate stress (iv) Percentage elongation (v) Percentage reduction in area (vi) Safe stress using a factor of safety of 1.5.

13 A simply supported beam of length 5m carries a uniformly increasing load of 800N/m run at one end to 1600N/m run at the other end. Draw the shear force and bending moment diagrams for the beam. Also evaluate the position and magnitude of maximum bending moment. 10M

OR

14 Draw the Shear force and bending moment diagram for the loaded beam as shown in figure. 10M



15 A 61cm× 19cm I- joist has 2.7cm thick flanges and 1.5cm thick web. Calculate the maximum intensity of shear stress and sketch the distribution of stress across the section, the S.F. at the cross-section being 600kN. 10M

OR

16 Derive the Bending movement equation. 10M

17 An element in a structure is subjected to a plane stress system that has the stress values σ_x=100 MPa, σ_y=140 MPa and τ_{xy}= 50 MPa. Draw a Mohr's circle and find (i) principal stresses and principal directions (ii) the maximum shear stress and the accompanying normal stress. 10M

OR

18 a) Write short notes on Von Mises Theory. 4M

b) A bolt is subjected to an axial pull of 9 kN and a transverse shear of 4.5 kN. Determine the diameter of the bolt if the elastic limit in tension is 225 MPa using maximum principal stress theory and the maximum shear stress theory. Assume a factor of safety of 3. 6M

19 a) State the assumptions made in the theory of torsion. 4M

b) A solid steel shaft of an automobile axle is required to transmit a torque of 20 kN-m. If the shear stress is not to exceed 70 N/mm^2 and the angle of twist is limited to 0.2 degree per meter, find a suitable diameter for the shaft. Given G=84 Gpa. 6M

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/mm^2 .If the maximum principal stress is not to exceed 120 N/mm^2 , find the thickness of the shell. Assume E = 2 x 10^5 N/mm^2 and Poisson's ratio = 0.25. Find the change in diameter, length and volume of the shell. 10M