R18 Regulation *Subject code: 2P3AC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

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

STRENGTH OF MATERIALS-I

(CIVIL ENGINEERING)

Maximum Marks: 70 Date:01.04.2023 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 which carries 10M.
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 Hooke's law.
2. Compare Youngs and Rigidity modulus.
3. Discuss the concept of shear force and bending moment.
4. Define Point of contra flexure.
5. Define Section Modulus
6. Draw the distribution of shear stress for I-Section.
7. Discuss about Macaulay's method.
8. Formulate the equation for maximum slope and deflection for a Cantilever beam with UDL throughout the section.
9. Define Mohr's circle of stresses.
10. Define Principal Plane.

Part-B

Answer All the following questions. (10MX 5=50Marks)

11. A. Compare Elasticity and plasticity. (3+7)
    B. A steel tube of 70 mm external and 60 mm internal diameters encloses centrally a copper rod of 50 mm diameter and held rigidly at their ends at a temperature of 30°C. Determine the stresses in steel tube and copper rod at a temperature of 120°C. Take E for steel = 200 kN/mm^2, E for copper = 100 kN/mm^2, α for steel = 12 x 10^{-6} per °C and α for copper = 18 x 10^{-6} per °C.

OR

12. A bar 30 mm in diameter is subjected to a tensile load of 54kN and the measured extension on 300 mm gauge length is 0.112 mm and change in diameter is 0.00366 mm. Calculate Poison's ratio and the values of three moduli. (10)
13. An overhanging beam ABC of length 7 m is simply supported at A and B over a span of 5 m and portion BC overhangs by 2 m. Draw the shear force and bending moment diagrams and determine the point of contra-flexure if it is subjected to uniformly distributed loads of 3 KN/m over the portion AB and a concentrated load of 8 kN at C. (10)

OR

14. A cantilever beam 4m long carries a load of 50 kN at 2 m from the free end, and a load of W at the free end. If the deflection at the free end is 25mm, Calculate the magnitude of the load W, and the slope at the free end, taking E as 200 kN/mm^2, I as 5 × 10^7 mm^4. (10)

15. A. Draw the shear stress distribution across Circular section. (3+7)
    B. Discuss about theory of simple bending with its assumptions.

OR

16. A. Obtain the shear stress distribution for a rectangular cross section 230 mm x 400 mm subjected to a shear force of 40 kN. Calculate the maximum and average shear stress.
B. Derive the expression for the shear stress distribution over rectangular beam. (5+5)

17. A beam AB of 8 m span is simply supported at the ends. It carries a point load of 10 kN at 1 m from the end A and a uniformly distributed load of 5 kN/m for a length of 2 m from the end B. If $I = 10x10^6$ mm^4, Using Macaulay`s Method, Determine the deflection at the mid-span, Maximum deflection, and Slope at the end A. (10)

OR

18. A simply supported beam of length with 4m carries 5 kN at 1m from each end. Using the Conjugate Beam method, taking E is 2×10^5 N/mm^2 and I is 10^8 mm^4 for the beam. Calculate (i) Slope at each end and under each load. (ii) Deflection at the centre. (10)

19. Draw Mohr's Circle for Principal Stress of 40 MPa (tensile) and 25 MPa (compressive). Find magnitude and direction of resultant stress on plane making an angle of 60° with the plane of the greater principal stress. Also determine the normal and shear stresses on this plane. (10)

OR

20. A. Elaborate the various theories of failure and their significance. (5+5)
B. Discuss Maximum Shear Stress and Maximum Strain Energy Theory.