Regulation R18 *Subject code:* 2P3AC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular/Supplementary Examinations, February 2021

STRENGTH OF MATERIALS-I

(Civil Engineering)

Maximum Marks: 70 Date: 22.02.2021 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 and its limitation.
2. Write the expression relating the various elastic constants and specify the terms clearly.
3. Mention the different types of loading on beams.
4. What is point of contra flexure?
5. Define flexural rigidity.
6. Define section modulus.
7. Compare a real beam with a conjugate beam.
8. What are the various methods to find the deflection and slope in beams?
9. Define principal stress and principal strain.
10. Mention the use of Mohr's circle.

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11. Draw and explain the nominal stress-strain diagram for mild steel rod subjected to uniaxial tension.(10M)

(OR)

12. A cast iron flat 300 mm long and 30 mm (thickness) × 60 mm (width) uniform cross section, is acted upon by the following forces : 30 kN tensile in the direction of length, 360 kN compression in the direction of width, 240 kN tensile in the direction of thickness. Calculate the direct strain, net strain in each direction and change in volume of the flat. Assume the modulus of elasticity and Poisson's ratio for cast iron as 140 kN/mm^2 and 0.25 respectively.(10M)

13. A Simply supported beam of length 6m carries an UDL of 20kN/m throughout its length and a point load of 30 kN at 2 m from the right support. Draw the shear force and bending moment diagram. Also mark the salient points in the diagram.(10M)

(OR)

14. A cantilever 1.5m long is loaded with a uniformly distribution load of 2 kN/m run over a length of 1.25m from the free end, it also carries a point load of 3kN at a distance of 0.25m from the free end. Draw the shear force and bending moment diagram of the cantilever beam.(10M)

15. With reference to the theory of simple bending, derive the bending moment equation. Mention the assumption used in derivation.(10M)

(OR)

16. Sketch and explain the variation of shear stress distribution across the following beam sections: circle, rectangle, I-section and T-section.(10M)

17. A beam AB of length 8 m is simply supported at its ends and carries two point loads of 50 kN and 40 kN at a distance of 2 m and 5 m respectively from left support A. Determine the deflection under each load, maximum deflection and the position at which maximum deflection occurs. Take $E = 2 \times 10^5$ N/mm^2 and $I = 8.5 \times 10^6$ mm^4.(10M)

(OR)

18. A simply supported beam of uniform flexural rigidity 'EI' and span '*l*', carries two symmetrically placed loads 'P' at one–third of the span from each end. Find the slope at the supports and the deflection at mid–span. Use moment area theorem.(10M)

19. At a point in a strained material, the horizontal tensile stress is 80 N/mm^2 and the vertical compressive stress is 140 N/mm^2. The shear stress is 40N/mm^2. Find the principal stresses and the principal planes. Find also the maximum shear stress and its planes.(10M)

(OR)

20. The principal stresses at a point in an elastic material (mild steel) are 20 N/mm^2 (tensile), 100N/mm^2 (tensile) and 50N/mm^2 (Compressive). Determine the chances of failure according to maximum principal stress theory and maximum principal strain theory.(10M)