R20 Regulation *Subject code: 3P3AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular Examinations, February 2022

Strength of Materials-1

(Civil Engineering)

Maximum Marks: 70 Date:24.02.2022 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 Explain with a neat sketch, proof stress and strain Hardening.
2 Explain briefly principle of super position.
3 Write the assumptions in the theory of simple bending.
4 Describe different types of beams and different types of loads.
5 Write down formula for maximum shear force and bending moment in case of a cantilever beam subjected to uniformly distributed load running over entire span.
6 Derive section modulus for a circular section.
7 Draw Mohr circle for the state of pure shear in a strained body and mark all salient points in it.
8 Name the theories of failures.
9 Why moment area method is more useful, when compared with double integration method.
10 Explain the theorem of conjugate beam method.

Part-B

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

11 a) Draw the stress strain curve for mild steel and mark the salient features.
b) A mild steel rod of 20mm diameter and 30mm long is enclosed centrally inside a hollow copper tube of external diameter 30mm and internal diameter 25mm.The ends of the tube are brazed together , and the composite bar is subjected to an axial pull of 40KN. If E for steel and copper is 200GN/m^2 and 100GN/m^2 respectively. Find the stresses developed in the rod and the tube also find the extension of the rod. 10M

OR

12 A steel rod of 20mm diameter passes centrally through a copper tube of 50mm external diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50^0 C, calculate the stresses developed in copper and steel. Take E for steel and copper is 200GN/m^2 and 100GN/m^2 respectively and α for steel and copper as $12x10^{-6}$ per ^{0}C and $18x10^{-6}$ per ^{0}C respectively. 10M

13 a) What is meant by positive and sagging BM.

b) An overhanging beam ABC of length 7m is simply supported at A and B over a span of 5m and the portion BC overhangs by 2m. Draw the SFD &BMD. Determine the points of contraflexure if it is subjected to UDL of 3KN/m over a span of 3m from B and a concentrated load of 8KN at C. 10M

OR

14 A beam of uniform section 10m long carries a UDL of 2KN/m for the entire length and a concentrated load of 10KN at right end. The beam is freely supported at the left end. Find the position of second support so that the maximum bending moment in the beam is as minimum as possible. Also compute the maximum bending moment. 10M

15 A beam of size 150mm wide , 250mm deep carries a UDL of w KN/m over a entire span of 4m. A concentrated load of 1 KN is acting at a distance of 1.2m from the left support. If the bending stress at a section 1.8m from the left support is not to be exceed $3.25N/mm^2$, find the load w. 10M

OR

16 The cross section of joint is a T-section 120mmx200mmx12mm, with 120mm side horizontal . sketch the shear stress distribution and hence the maximum shear stress, if it has to resist a shear force of 200KN. 10M

17 A beam AB of length 8m is simply supported at its ends and carries two point loads of 50KN and 40KN at a distance of 2m and 5m respectively from left support. Determine deflection under each load, maximum deflection and the position at which maximum deflection occurs. Take E $=2x10^5N/mm^2$ and I$=8.5x10^6$ mm^4. 10M

OR

18 Find the maximum deflection and slope by using Macaulay's method for a simply supported beam of span 10m. Beam carries a point load of 15KN at a distance of 2m from the left end and a UDL of 50KN/m for a length of 3m from the right end. Take E $=2x10^5N/mm^2$ and I$=8.5x10^6$ mm^4. 10M

19 At a certain point from the strained material, the stress on two planes are at right angles to each other are $20N/mm^2$ and $10N/mm^2$. evaluate the principle stress and maximum shear stresses and location of principal plane. 10M

OR

20 A cylindrical shaft made of steel of yield strength 350MPa is subjected to static load consisting of bending moment 10KN.m and a torsional moment of 30KNm . determine the diameter of shaft using a) maximum principle stress theory b) maximum shear force theory c) maximum strain energy theory and d) maximum distortion energy theory take E=210GPa, poisons ratio 0.25, and factor of safety =2. 10M