R20 Regulation *Subject code:* 3P3CF

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular Examinations, February 2022

MECHANICS OF SOLIDS

(MECHANICAL ENGINEERING)

Maximum Marks: 70 Date:26.02.2022 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 What is the importance of factor of safety?
2 Define linear strain and lateral strain.
3 How do you classify loads? Give Examples.
4 Define the following terms: a) Bending moment b) Point of contra flexure
5 Write the formula for bending equation. Explain the parameters involved in it.
6 Draw the shear stress distribution for the following: a) I-section b) Rectangular beam
7 Write a short note on Von Mises theory.
8 What are the methods used for determining stresses on obliges section?
9 Explain about theory of pure torsion.
10 Explain why wire wound the thin cylinders are more efficient than ordinary thin cylinders.

Part-B

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

11 (a) State Hooke's Law. Explain elastic limit. 4M

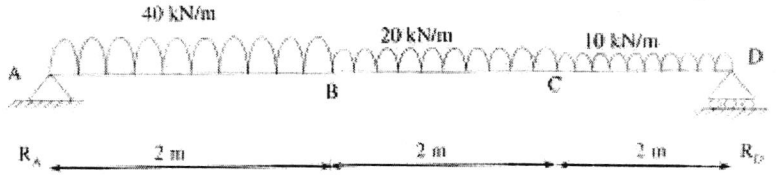
(b) A vertical round steel rod 1.82 meters long is securely held at its upper end and a weight sliding freely on the rod falls on to a stop at the lower end of the rod. When the weight falls from a height of 30 mm the maximum stress reached in the rod is estimated to be 157 N/mm². Determine the stress if the load had been gradually applied and also the maximum stress if the load had fallen from a height of 45 mm. Take E = 2 x 105 N/mm². 6M

OR

12 (a) Draw tress strain diagram for mild steel. Indicate salient points and define them. 4M

(b) Obtain a relation for the stress induced in a body if a load P is applied on tapered rectangular section. 6M

13 Draw the shear force and bending moment diagrams for a simple supported beam loaded as shown in figure below. Also find and show value of maximum bending moment. 10M



OR

14 What are the different types of beams? Describe the behavior of each of them when point load applied. 10M

15 (a) Explain the theory of simple bending. State the assumptions made in the theory of simple bending. 6M

(b) A beam of I-section 300 mm deep and 150 mm wide. The flanges are 10 mm thick and web thickness 8 mm. At a section the beam is subjected to a shear force of 150 KN. Determine the proportion the flanges and the web resist the applied shear. 4M

OR

16 A beam of I-section 350 mm deep and 200 mm wide has equal flanges 25 mm thick and web 20 mm thick. It carries, at a section shear fore of 300 KN. Draw the distribution of shear stress values across the section and also indicate the values at important points. Find the ratio of maximum to mean shear stress. 10M

17 Derive the expression for stresses in arbitrary plane in a body subjected to bi-axial stress condition. 10M

OR

18 Direct stresses of 100 N/m² (tensile) and 90 N/mm² (compressive) exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stresses on the planes. The greater principal stress at the point due to these is 150 N/mm².

(a) Find the shear stresses on these planes.

(b) Find also the maximum shear stress at the point. 10M

19 Derive the relationship for longitudinal and circumferential stress for thin cylinder. 10M

OR

20 A solid aluminum shaft 1 m long and 50 mm diameter is to be replaced by a tubular steel shaft of the same length and same outside diameter such that each of the two shafts could have the same angle of twist per unit torsional moment over the total length. What must be the inner diameter of the tubular shaft? Modulus of rigidity of steel is three times that of aluminum. 10M