



R20 Regulation *Subject code: 3P4AC*
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)
B.Tech IV Semester Regular Examinations, July 2022

STRENGTH OF MATERIALS - II
(CIVIL ENGINEERING)

Maximum Marks: 70

Date: 26.07.2022 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 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 Define torsional rigidity
- 2 Why are hollow circular shafts preferred when compared to solid circular shafts?
- 3 What are the types of column?
- 4 Define slenderness ratio.
- 5 Differentiate between symmetrical and unsymmetrical bending.
- 6 Define core of a section.
- 7 What are hoop stresses?
- 8 Write Lamé's formulae.
- 9 Define Shear centre.
- 10 Define neutral axis

Part-B

Answer All the following questions.

(10MX 5=50Marks)

- 11 A hollow shaft with a diameter ratio $\frac{3}{8}$ is required to transmit 500 KW at 100 rpm, the maximum torque being 20% greater than the mean. The maximum shear stress is not to exceed 60 N/mm^2 and the twist in length of 3 m is not to exceed 1.4° . Calculate the minimum diameters required for the shaft. $C=84 \text{ KN/mm}^2$. (10)

OR

- 12 The stiffness of a close coiled helical spring is 15 N/mm of compression under a maximum load of 60 N; the maximum shearing stress produced in the wire of the spring is 125 N/mm^2 . The solid length of the spring (when the coils are touching) is given as 5 cm find
- a) Diameter of wire
 - b) mean diameter of the coils and

Number of coils required, take the modulus of rigidity is $4.5 \times 10^4 \text{ N/mm}^2$. (10)

- 13 Derive an expression for maximum stress of beam column laterally loaded with a compressive load. (10)

OR

- 14 A steel bar of rectangular cross-section $30 \times 50 \text{ mm}$ pinned at each end is 2 m long. Determine the buckling load when it is subjected to axial compression and also calculate axial stress using Euler's expression. Determine the minimum length for which Euler's equation may be valid. Take proportionality limit as 250 MPa and $E = 200 \text{ GPa}$. (10)

- 15 a) A load of 2MN is applied on a short concrete column 50mm x 50mm. the column is reinforced with fair steel are of 10mm diameter one in each corner. Find the stresses in the concrete and the steel bars. Take E- for steel as $2.1 \times 10^5 \text{ N/mm}^2$ and for concrete as $1.4 \times 10^4 \text{ N/mm}^2$. (5)
- b) A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and tensile stress of 47 N/mm^2 on a plane at right angles to the former. Each of the above stresses is accompanied by a shear stress of 63 N/mm^2 . Determine principal stresses, principal planes and the maximum shear stress. (5)
- OR
- 16 Discuss the stresses briefly in beams subjected to unsymmetrical bending. (10)
- 17 Derive the expression for the change in volume of a thin cylinder subjected to internal fluid pressure. (10)
- OR
- 18 A thick cylinder with an external diameter of 320 mm and an internal diameter of 160 mm is subjected to an internal pressure of 8 N/mm^2 . Draw the variation of radial and hoop stresses in the cylinder wall. Also, determine the maximum shear stress in the cylinder wall. (10)
- 19 Derive the equations core or kernel of rectangular and circular section. (10)
- OR
- 20 Explain briefly the method of locating the shear centre. (10)