



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 3P4AC

B.Tech IV Semester Regular/Supplementary Examinations, September 2023

Strength of Materials-II

(Civil Engineering)

Maximum Marks: 70

Date: 19.09.2023 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 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 Under what circumstances are hollow shafts preferred over solid shafts?
- 2 Give the advantages of leaf spring over helical spring.
- 3 State any four assumptions used in Euler's column theory.
- 4 A solid round bar, 4 m long and 6 cm in diameter is used as a strut with both ends fixed. Determine the crippling load. Take $E = 2 \times 10^5 \text{ N/mm}^2$
- 5 Give the stability conditions for retaining walls.
- 6 Write the stresses in dams.
- 7 Define hoop stress in thin cylinder.
- 8 Write the expression for radial pressure at any radius 'x' for a thick cylinder.
- 9 Define Neutral axis.
- 10 What is the shear centre of a beam?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Derive an expression for the shear stress produced in a solid circular shaft which is subjected to pure torsion. Mention the assumptions used in derivation. [10]
OR
- 12 Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, $G = 84 \text{ kN/mm}^2$. Neglect the effect of stress concentration. [10]
- 13 A T-section $150 \text{ mm} \times 120 \text{ mm} \times 20 \text{ mm}$ is used as a 4 m long strut, hinged at both ends. Calculate the crippling load, if Young's modulus for the material of the section is 200 kN/mm^2 . [10]
OR
- 14 A 1.2 m long column has a circular cross-section of 4.8 cm diameter. One of the ends of the column is fixed in direction and position while the other end is free. Taking factor of safety as 2, Report the safe load using.
(i) Rankine's formula. Take yield stress $\sigma_c = 560 \text{ N/mm}^2$ and $\alpha = 1/1600$ for pinned ends.
(ii) Euler's formula. Take $E = 1.2 \times 10^5 \text{ N/mm}^2$. [10]

- 15 A masonry dam (density = 18 kN/m^3), 8 m high, 4 m wide at base and 1.8 m wide at the top has a vertical water face. Find the maximum and minimum pressure intensities at the base, if density of water is 10 kN/m^3 . [10]

OR

- 16 A curved beam, semi-circular in plan and supported on three equally spaced supports carries a uniformly distributed load of W per unit of circular length. Analyze the beam and sketch the bending moment and twisting moment diagram. [10]
- 17 A boiler is subjected to an internal steam pressure of 2.2 N/mm^2 . The thickness of boiler plate is 2.7 cm and permissible tensile stress is 130 N/mm^2 . Find out the maximum diameter, when the efficiency of longitudinal joint is 90% and that of circumferential joint is 40%. [10]

OR

- 18 A thick spherical shell of 200 mm internal diameter is subjected to an internal fluid pressure of 7 N/mm^2 . If the permissible tensile stress in the shell material is 8 N/mm^2 , find the thickness of the shell. [10]
- 19 A beam of rectangular section, 40 mm wide and 60 mm deep is subjected to a bending moment of 10 kNm. The trace of the plane of loading is inclined at 45° to the y-y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section. [10]

OR

- 20 Locate the shear center of an I-section of a beam with following specifications:
Top flange: 180 mm x 30 mm, Bottom flange: 180 mm x 30 mm, Web: 18 mm x 240 mm. The center line of web is 100 mm from the left edge of flange and 80 mm from the right edge. [10]