R20 Regulation *Subject code: 3P4AC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, June 2026

STRENGTH OF MATERIALS-II

(CE)

Maximum Marks: 70 Date: 12.06.2026 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)		Marks	CO	BTL
1	State the theory of pure torsion.	2M	1	L1
2	List the difference between torsional failure surfaces in ductile and brittle materials.	2M	1	L1
3	What is the significance of Rankine's empirical formula?	2M	2	L1
4	What are the limitations of Euler's column theory?	2M	2	L1
5	State the condition for no tension in the section.	2M	3	L1
6	State the assumptions made in Lame's theory.	2M	3	L1
7	What is the circumferential, longitudinal stresses in a thin cylinder	2M	4	L1
8	A boiler shell 200 cm diameter and 1.5 cm thickness is subjected to an internal fluid pressure of 1.5 MPa. What is the hoop stress induced in the vessel?	2M	4	L1
9	Write the reasons for unsymmetrical bending.	2M	5	L1
10	Write the shear centre equation for channel section.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Design a hollow steel shaft of length 3 m to transmit 120 kW at 300 rpm. The shear stress is to be limited to 75 N/mm^2 and the angle of twist in not to exceed 0.50 per meter length of shaft. Assume the internal diameter of the shaft is half the external diameter. Use the modulus of rigidity is 0.85×10^5 N/mm.	10M	1	L2
	OR			
12	A solid circular shaft is subjected to a bending moment of 300 kNm in addition to a twisting moment of 125 kNm. If the yield stress of the shaft material is 325 N/mm^2, design the shaft according to the (a) maximum shearing stress and (b) maximum principal stress theories of failures.	10M	1	L2
13	A cast iron column of hollow circular section has outside diameter 300 mm, thickness 22 mm and length 6.6 m is fixed at both ends. Determine the safe load carrying capacity of the column with a factor of safety of 3. The Rankine's	10M	2	L2

	constants are fc = 550 MPa and α =1/ 1600 . Also find the Euler's buckling load. Adopt E = 1×10^5 N/mm^2 .			
	OR			
14	A curved beam semi-circular in plan has 5 m radius and supported on three equally spaced supports. The beam carries a uniformly distributed load of 50 kN/m of the circular length. Analyse the beam and draw the twisting moment diagram.	10M	2	L2
15	A steel hinged I- strut, 50 mm × 100 mm × 6 mm, of length 3 m is subjected to an axial load of 60 kN in addition to a transverse uniformly distributed load 20 kN/m length over its entire span. Determine the bending moment.	10M	3	L2
	OR			
16	Derive the expression to determine the stress in a circular ring acted upon by a tensile load.	10M	3	L2
17	A pipe of 500 mm internal diameter and 100 mm thickness contains a fluid at a pressure of 6 N/mm^2. Find the maximum and minimum hoop stresses across the section. Also sketch the radial pressure distribution across this section.	10M	4	L2
	OR			
18	A shell 3.0 m long, 1 m in diameter is subjected to an internal pressure of 1.2 N/mm^2. If the thickness of the shell is 10cm, find the circumferential and longitudinal stresses. Find also the maximum shear stress and the changes in the dimensions of the shell. Take E = 210 kN/mm^2 and 1/m = 0.3.	10M	4	L2
19	Find the shear center for unsymmetrical C and I -section.	10M	5	L2
	OR			
20	A simply supported steel beam of span 3.6 m has I-section 125 mm × 200 mm × 10 mm is subjected to equal and opposite moments of 10 kNm acting at the ends of the beam in a plane making an angle 30^0 with respect to vertical and passing through the centroid of the section. Determine the maximum stresses induced at any cross-section of the beam.	10M	5	L2