



R22 Regulation

Subject code:4E4AB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2025

STRENGTH OF MATERIALS – II

(CE)

Maximum Marks: 60

Date:18.12.2025

Duration: 3 hours

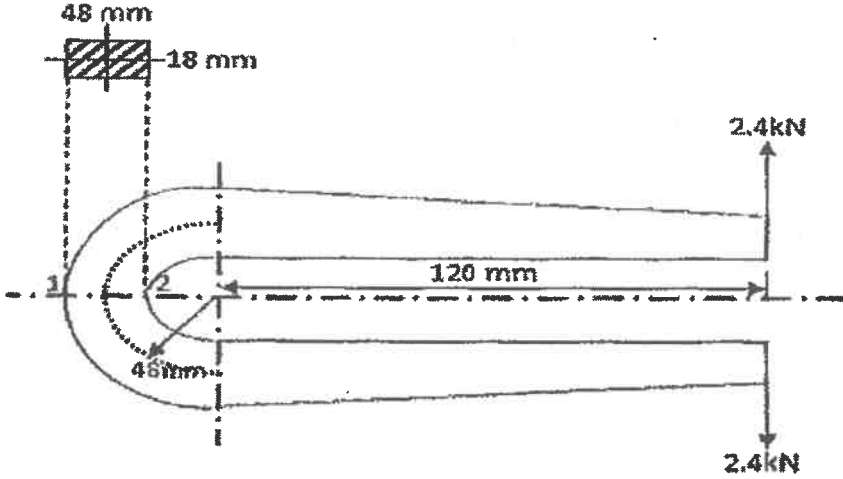
- Note:**
- 1.This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	List the assumptions made in the theory of pure torsion.	1M	CO1	BT1
b)	Give the mathematical expression for deflection of an open coiled helical spring.	1M	CO1	BT1
c)	Mention the limitations of Euler's theory of columns.	1M	CO2	BT1
d)	Compare long column and short column.	1M	CO2	BT2
e)	Define kernel of a section.	1M	CO3	BT1
f)	Give the condition for stability of a chimney.	1M	CO3	BT1
g)	A cylinder of internal diameter 2.5 m and thickness 50 mm, contains a gas. If the tensile stress in the material is not to exceed 80 N/mm ² , determine the internal pressure of gas.	1M	CO4	BT2
h)	State Lamé's equation.	1M	CO4	BT1
i)	List the causes for unsymmetrical bending of beams.	1M	CO5	BT1
j)	Define principal axes of a cross section.	1M	CO5	BT1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	A solid aluminium shaft of length 1.5 m and 60 mm diameter is to be replaced by a tubular steel shaft of the same length and the same outside diameter, such that each of the shafts has the same angle of twist per unit torsional moment over the total length. Determine the inner diameter of the tubular steel shaft, if the modulus of rigidity of steel is three times that of aluminium.	10M	CO1	BT3
OR				
3	A closely coiled helical spring made of 10 mm diameter steel wire has 15 coils of 100 mm mean diameter. The spring is subjected to an axial load of 105 N. Find the maximum shear stress induced, deflection and stiffness of spring, if modulus of rigidity is 8.1×10^4 N/mm ² .	10M	CO1	BT3

4	<p>a) Derive an expression for Euler's critical load of a column with one end fixed and the other end hinged, from first principles.</p> <p>b) Determine the section of a cast iron hollow cylindrical column 3 m long with both ends fixed, if it carries an axial load of 800 kN. The ratio of internal to external diameter of the column is 5/8. Use Rankine's formula by taking the Rankine's constant as 1/1600 and crushing strength of material as 550 N/mm².</p>	4M 6M	CO2	BT3
OR				
5	<p>A four meter long hollow circular cast iron column with fixed ends has 200 mm external diameter and 20 mm thickness. The column carries a load of 130 kN at an eccentricity of 30 mm from the axis of the column. Determine (i) the extreme stresses on the cross section (ii) the maximum eccentricity when there is no tension anywhere on the cross-section. The elastic modulus of the material of column is 60 GPa.</p>	10M	CO2	BT3
6	<p>A masonry dam 6 m high, 3 m wide at base and 1.2 m wide at the top retains water on vertical face for full height. Considering the density of masonry as 17 kN/m³ and density of water as 10 kN/m³, find the maximum and minimum pressure intensities at the base.</p>	10M	CO3	BT3
OR				
7	<p>A curved beam shown in figure is subjected to a load of 2.4 kN. Find the resultant stresses at points 1 and 2 and also the position of neutral axis.</p> 	10M	CO3	BT3
8	<p>A steel cylindrical shell, 3 m long, closed at its ends, has an internal diameter of 1.5 m and a wall thickness of 20 mm. Calculate the circumferential and longitudinal stress induced and also the change in dimensions of the shell, if it is subjected to an internal pressure of 1.1 N/mm². Assume the modulus of elasticity and Poisson's ratio for steel as 200 kN/mm² and 0.3 respectively.</p>	10M	CO4	BT3
OR				

9	A steel tube of 200 mm external diameter is to be shrunk on to another steel tube of 60 mm internal diameter. After shrinking the diameter at the junction is 120 mm. Before shrinking on the difference of diameter at the junction is 0.08 mm. Find the hoop stresses developed in the two tubes after shrinking on and radial pressure at the junction. Take young's modulus as $2 \times 10^5 \text{ N/mm}^2$.	10M	CO4	BT3
10	At a point in a material, the stresses on two mutually perpendicular planes are 70 N/mm^2 (tensile) and 40 N/mm^2 (tensile). The shear stress across these planes is 12 N/mm^2 . Find the magnitude and direction of the resultant stress on a plane, making an angle of 30° with the plane of first stress. Also find the normal and tangential stresses on this plane. Use graphical method.	10M	CO5	BT3
OR				
11	Discuss the concept of shear centre and analyse the shear centre of a channel section of 400 mm x 200 mm outside and 5 mm thickness.	10M	CO5	BT3

