R22 Regulation *Subject code:4E4AB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Regular/Supplementary Examinations, June 2026

STRENGTH OF MATERIALS – II

(CE)

Maximum Marks: 60 Date:10.06.2026 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)	Define the terms; torsion, torsional rigidity.	1M	1	L1
b)	List out various types of springs.	1M	1	L2
c)	Classify the type of columns based on L/D ratio and slenderness ratio.	1M	2	L1
d)	A hollow circular column with external diameter 100 mm and internal diameter 80 mm, what is its radius of gyration?	1M	2	L2
e)	What do you mean by core of a column section?	1M	3	L1
f)	What is the differences between a dam and a retaining wall?	1M	3	L1
g)	What are the Lame's assumptions of thick cylinders?	1M	4	L1
h)	Write a short note on stresses generated in cylindrical shells.	1M	4	L1
i)	What do you understand by the term unsymmetrical bending?	1M	5	L1
j)	Draw the shear centre for channel section	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) List out an assumption in torsion equation and derive the torsion equation with neat sketch.	5M	1	L2
	b) A solid shaft of diameter 80mm is subjected to a twisting moment of 8MN-mm and a bending moment of 5MN-mm at a point. Determine; i) Principal stresses (ii) Position of the plane on which they act.	5M	1	L2
	OR			
3	A hollow shaft of diameter ratio 3/8 (internal diameter to outer diameter) is to transmit 375kW power at 100 r.p.m. The maximum torque being 20% greater than the mean. The shear stress is not to exceed 60N/mm^2 and twist in a length of 4m not to exceed 20. Calculate its external and internal diameters which would satisfy both the above conditions. Assume modulus of rigidity, G= 0.85X10^5 N/mm^2.	10M	1	L3
4	a) Derive the Euler's formula for one end is fixed and other end is hinged.	5M	2	L2

	b) Using Euler's formula, Calculate the critical stresses for a series of struts having slenderness ratio of 20,60 100,140 and 180 under the following conditions: i)Both ends hinged ii) Both ends fixed. Take E= $2X10^5$ N/mm^2	5M	2	L2
	OR			
5	A 1.4 m long column has a circular cross –section of 5 cm diameter. One of the ends of the column is fixed in direction and position and other end is free. Taking factor of safety as 4, Calculate the safe load using: a) Rankine's formula, take yield stress, 560 N/mm^2 and a=1/1600 for pinned ends. b) Euler's formula, Young's modulus for C.I =$1.2X10^5$ N/mm^2 .	 5M 5M	2	L3
6	Draw a neat sketches of Kernal of the following cross sections; i) Rectangular 200mmX 300mm ii) Hollow circular cylinder with external diameter=300mm, thickness = 50mm	5M 5M	3	L3
	OR			
7	A masonry retaining wall of trapezoidal section is 8m high and retains earth which is level up to the top. The width at the top is 1.5 m and exposed face is vertical. Find the minimum width of the wall at a bottom in order the tension may not be induced at the base. Masonry and earth have densities 2300kg/m^3 and 1600kg/m^3 respectively. The angle of repose of the soil is 30°.	10M	3	L3
8	A cylindrical vessel whose ends are closed by means of rigid flange plates, is made of steel plate 1.5cm thick. The length and the internal diameter of the vessel are 6m and 120 cm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 2.5N/mm^2. Also calculate the increase in length, diameter and volume of the vessel. Take E= $2X10^5$ N/mm^2 and u=0.3.	10M	4	L3
	OR			
9	A spherical shell of internal diameter 0.7m and of thickness 12mm is subjected to an internal pressure of 1.5N/mm^2. Determine the increase in diameter and increase in volume. Take E= $2X10^5$ N/mm^2 and u=1/3.	10M	4	L3
10	a) Define shear center. What is the importance of shear center? b) Derive the deflection of beams due to unsymmetrical bending.	6M 4M	5 5	L3 L3
	OR			
11	A simply supported beam of span 4m carries a load of 250N at its centre. The section of the beam is an equal angle of size 80mm by 80mm and 10 mm thick. The load line passes through G of the section. Determine. (i) Position of neutral axis (ii) Stresses at centroid point (iii) Deflection of beam at the mid section. Take E= $2x10^5$ N/mm^2.	10M	5	L3