R18 Regulation *Subject code: 2P3AC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, February 2024

STRENGTH OF MATERIALS-I

(CIVIL ENGINEERING)

Maximum Marks: 70 Date: 21.02.2024 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)	**CO**	**BTL**
1	Define a) Strain Energy b) Resilience	CO1	L1
2	Draw the stress strain curve for mild steel.	CO1	L1
3	What is meant by point of contra flexure?	CO2	L1
4	Mention various types of loads	CO2	L1
5	Define pure or simple bending	CO3	L1
6	What are the assumptions involved in simple bending theory?	CO3	L1
7	Write the Mohr's theorems for find the slope and deflection	CO4	L1
8	Mention the Relationship between deflection Slope and curvature of the beam	CO4	L1
9	Find normal and shear stresses for a member subjected to direct stress in one plane	CO5	L1
10	Define Principal stress and Principal strain	CO5	L1

Part-B

	Answer All the following questions. **(5X10M=50Marks)**	M	**CO**	**BTL**
11	Explain in detail about the stress strain curve of a mild steel material	10M	CO1	L3
	OR			
12	a) A tensile load of 60kN is gradually applied to a circular bar of 4cm dia. And 5m long. If E =2X10^5 N/mm^2 determine: i) Strength in the rod ii)Stress in the rod iii) Strain energy absorbed by the rod	5M	CO1	L3
	b) Determine the volumetric strain and final volume of the given bar which is 4m long, 30mm wide and 20mm thick and is subjected to an axial pull of 30kN in the direction of its length. Take Young's modulus 2x105 N/mm2 and Poisson's ratio 0.3	5M		L3
13	a) Draw the shear force and bending moment diagram for the overhanging beam ABC 6m long carries an UDL of 2kN/m entire span. The span AB of length 4m and over hanging portion BC 2m. Locate the point of Contra flexure.	5M	CO2	L4
	b) A simply supported beam of length 9m carries a point load of 4kN, 10kN, 7kN at a distance of 1.5m, 2.5m and 2m respectively	5M		L4

	from the left end. Draw the shear force and bending moment diagram			
	OR			
14	a) A simply supported beam of length 9m carries a UDL of 10kN/m run over a length between 2m to 6m from left end and Two point loads of 45kN and 50kN at a distance of 2m, 6m from left end. Draw the shear force and bending moment diagram.	5M	CO2	L4
	b) A cantilever 1.5m long is loaded with UDL of 1.5kN/m run over a length of 1.25m from the free end. It also carries a point load of 3kN at a distance of 0.25m from the free end. Draw the shear force and bending moment diagram	5M		L4
15	a) A Square beam 20mm x 20mm in section and 2m long is supported at the ends. The beam fails when a point load of 400N is applied at the centre of the beam. What uniformly distributed load per meter length will break a cantilever of the same material 40mm wide, 60mm deep and 3m long	5M	CO3	L4
	b) A simply supported wooden beam of span 1.3m having a cross section 150mm wide by 250mm deep carries a point load W at the centre. The permissible stresses are $7N/mm^2$ in bending and $1N/mm^2$ in shearing. Calculate the safe load W.	5M		L4
	OR			
16	a) A timber beam of rectangular section of length 8m is simply supported and carries a UDL of 12kN/m run over the entire length and a point load of 10kn at 3m from the left support. If the depth of the beam is two times the width and the stress in the timber is not exceed 8N/mm2 find suitable dimensions of the section	5M	CO3	L3
	b) A un symmetrical beam of I section have the following dimensions. Top flange 250mmx50mm, Web 200mm x 50mm, Bottom flange 130mmx50mm. Find the position of neutral axis and moment of inertia of the section about the neutral axis. If the maximum bending moment on the section is 40MN mm, determine the maximum bending stress.	5M		L3
17	a) A beam of length 6m is simply supported at its end and carries a two point loads of 48kN and 40kN at a distance of 1m and 3m from left end. Find deflection under each load using Macaulays method. Take E = 2x $10^5 N/mm^2$ and I = 85x$10^6 mm^4$	5M	CO4	L4
	b) Determine: (i) slope at the left support (ii) deflection under the load and (iii) maximum deflection of a simply supported beam of length 5m, which is carrying a point load of 5kN at a distance of 3m from the left end. Take E=2x$10^5 N/mm^2$ and I = 1x10^8mm4	5M		L4
	OR			

18	a) A beam of length 5m and of uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9kN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is $7N/mm^2$ and central deflection is not to exceed 1cm. Take Young's Modulus for the material $1X10^4N/mm^2$ b) A beam of uniform rectangular section 200mm wide and 300mm deep is simply supported at its end. It carries a UDL of 9kN/m run over the entire span of 5m. If the value of E for the beam material is $1x10^4$ N/mm^2. Find slope at the supports and maximum deflection	5M 5M	CO4	L3 L3
19	a) At a point in a strained material, the principal stresses are $100N/mm^2$ tensile and $40N/mm^2$ compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 600 to the axis of the major principal stress. What is the maximum of shear stress in the material at the point? b) The tensile stresses at a point across two mutually perpendicular planes are $120N/mm^2$ and $60N/mm^2$. Determine the normal, tangential and resultant stresses on a plane inclined at 300 to the axis of the minor stress.	5M 5M	CO5	L3 L3
	OR			
20	At a point within a body subjected to two mutually perpendicular directions, the stresses are 80 N/mm^2 tensile and 40 N/mm^2 tensile. Each of the above stresses is accompanied by a shear stress of 60 N/mm^2. Determine the normal stress, shear stress and resultant stress on an oblique plane inclined at an angle of 450 with the axis of minor tensile stress.	10M	CO5	L4