Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

CIVIL ENGINEERING
Third Semester

CE5301 Strength of Materials
(Regulation 2019)

Time:3 hrs | Max. Marks: 100

CO1	Understand the concepts of stress and strain.
CO2	Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
CO3	Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
CO4	Analyze propped cantilever. fixed beams and continuous beams for external loadings and support settlements.
CO5	Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and study the various theories of failure

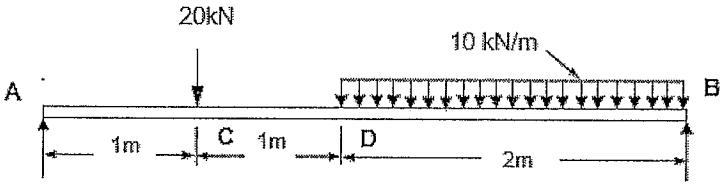
BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	Give the relationship between Young's modulus, Bulk modulus and Rigidity modulus.	2	1	L1
2	State the assumptions made in theory of pure torsion.	2	1	L1
3	Draw the shear stress distribution for a symmetrical I- section.	2	2	L2
4	Define bending moment.	2	2	L1
5	State the first area moment theorem.	2	3	L1
6	Draw the conjugate beam of a cantilever beam of span 'L' m subjected to uniformly distributed load of 'w' kN/m over the entire span.	2	3	L2
7	What are the advantages of a propped beam?	2	4	L2
8	Give the fixed end moments for a fixed beam of span 'L' m subjected to uniformly distributed load of 'w' kN/m over the entire span.	2	4	
9	State maximum distortion energy theory.	2	5	L1
10	When a section is symmetrical about two perpendicular axis, where will the shear centre of the section be located?	2	5	L2

PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	A thin cylindrical shell is 3 m long and is having 1 m internal diameter and 15 mm thickness. Determine the change in dimensions of the shell, if it is subjected to an internal fluid pressure of 1.5 N/mm^2. Also determine the change in volume. Take Young's modulus 'E' as 2 x10^5 N/mm^2 and Poisson's ratio 'μ' as 0.3.	13	1	L3

	OR			
11 (b)	At a point in an elastic material under strain, there are normal stresses of 30 N/mm^2 (tensile) and 15 N/mm^2 (tensile) respectively at right angles to each other, along with a shear stress of 25 N/mm^2. Find the following parameters (i) magnitude and directions of the principal planes and (ii) maximum shear stress and the position of its planes.	**13**	1	L3
12 (a)	Draw the shear force and bending moment diagrams for the simply supported beam loaded as shown in Fig..12(a).  Fig.12(a)	**13**	2	L3
	OR			
12 (b)	A simply supported beam of 4 m span carries an uniformly distributed load of 1.7 kN/m run over the entire span. The beam consists of T- section whose flange is 150 mm wide and 50 mm deep and the web is 150 mm x 50 mm. Find the stresses induced in the extreme fibers of the cross section.	**13**	2	L3
13 (a)	A beam AB of 10 m span is simply supported at the ends. It carries a concentrated load of 6 kN and 3 kN at a distance of 4 m and 7 m respectively from the end A. Take the Young's Modulus and moment of inertia as 200 kN/mm^2 and 200x10^6 mm^4 respectively. Determine the deflection under the two loads and slope at A.	**13**	3	L4
	OR			
13 (b)	A beam AB of 10 m span is simply supported at ends A and B. C is a point on the beam at a distance of 8 m from A. The beam has a moment of inertia of 320 x 10^6 mm^4 for a length of AC and 80 x 10^6 mm^4 for the length CB. The beam is loaded with a point load of 15 kN at C. Determine the slope at A, deflection at mid span and maximum deflection by conjugate beam method. Take Young's modulus as 200 kN/mm^2.	**13**	3	L4
14 (a)	A continuous beam ABCD 16 m long is simply supported at B, C, D and fixed at A. All the supports are at the same level. AB = 6 m, BC = 5m, CD = 5m. It carries concentrated loads of 80 kN and 6 kN at a distance of 2 m from support A and 3 m from support D respectively. There is a uniformly distributed load of 20 kN/m over the span BC. Determine support moments and support reactions. Also draw the shear force and bending moment diagrams.	**13**	4	L3
	OR			
14 (b)	A fixed beam of 6 m span carries concentrated loads of 80 kN each at a distance of 2m from each support. Determine the reactions and moments at the supports. Draw the bending moment and shear force diagrams.	**13**	4	L3

15 (a)	A thick cylindrical pipe of 300 mm outer diameter and 200 mm internal diameter is subjected to an internal pressure of 12 N/mm^2. What minimum external pressure can be applied so that the tensile stress in the metal shall not exceed 16 N/mm^2?	**13**	5	L3
	OR			
15 (b)	A bolt is subjected to an axial pull of 12 kN together with a transverse shear force of 6 kN. The maximum elastic stress in tension is 300N/mm^2. Take factor of safety as 3 and Poisson's ratio as 0.3. Determine the diameter of the bolt by using (i) Maximum principal stress theory (ii) maximum principal strain theory (iii) Maximum shear stress theory	**13**	5	L3

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	A beam of T-section consists of flange dimensions of 100 mm x 20 mm, web dimensions of 150 mm x 10 mm. The beam is 2.5 m in length and is simply supported at the ends. It carries a load of 3.2 kN inclined at 20° to the vertical and passing through the centroid of the section. Determine the maximum tensile stress and maximum compressive stress.	**15**	5	L5

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