



B.Tech IV Semester Supplementary Examinations, July 2024

Strength of Materials-II
(CE)

Maximum Marks: 70

Date: 23.07.2024 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	Bloom Tx
1	State the maximum principal stress theory.	1	L1
2	Determine the power (kW) transmitted by a shaft rotating at 150 rpm and subjected to a twisting moment of 30 kNm.	1	L1
3	What are the assumptions made in the derivation of Euler's formula?	2	L1
4	What are the modes of failure of short and long columns?	2	L1
5	Define core of a section and draw the core of a rectangular section 'BxD	3	L1
6	What are the conditions to be checked for the stability of a dam?	3	L1
7	Indicate the location of shear center of a symmetrical channel section	4	L1
8	Define the principal axes of a cross-section	4	L1
9	What is the necessity of shrinkage allowance in the process of fabrication of compound cylinders?	5	L1
10	A thin cylindrical shell of internal diameter 1250 mm and 10 mm thick is subjected to an internal fluid pressure of 5 N/mm ² . Determine the hoop stress.	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	A steel solid circular shaft is required to resist bending moment of 75 kNm in addition to twisting moment of 25 kNm. Design the shaft according to (a) maximum shear stress theory and (b) maximum strain energy theory. Adopt Poisson's ratio = 0.3 and the yield stress of the shaft material is 260 N/mm ² . (10)	1	L2
OR			
12	Design a close coiled helical spring with mean radius equal to 10 times the diameter of the wire. The spring is to absorb 1.2 kNm energy with an extension of 125 mm and the maximum shear stress in the spring is not to exceed 80 N/mm ² . The modulus of rigidity is 0.85×10^5 N/mm ² . (10)	1	L2
13	Design a hollow circular section mild steel column, 6.0 m long with both	2	L2

	ends hinged, to carry an axial load of 450 kN with a factor of safety of 3. Adopt the internal diameter is 0.75 times the external diameter. Adopt the Rankine's constants are $f_c = 325$ MPa and $\alpha = 1/7500$. (10)		
	OR		
14	Classify the types of columns based on slenderness ratio and end conditions. (10)	2	L2
15	A cast iron column of square section 400 mm \times 400 mm is subjected to a compressive load of 500 kN acting at a point i.e, 60 mm away from X-X axis (ey) and 80 mm away from Y-Y centroidal axis (ex). Determine the resultant stresses at the extreme corners of the section. (10)	3	L2
	OR		
16	a) What is Core of a section? What is its importance? (5) b) Determine the core for following sections: (5) i) Rectangular section ii) Hollow circular section	3	L2
17	A cylindrical shell 2.5 m long and closed at the ends has an internal diameter of 1.25m and wall thickness of 20 mm. Calculate the change in dimensions when subjected to an internal pressure of 1.5 MPa. Take $E = 200$ GPa, $\nu = 0.3$. (10)	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 $\nu = 0.3$. (10)	4	L2
19	Find the shear center for unsymmetrical C and I -section. (10)	5	L2
	OR		
20	A simply supported steel beam of span 3.6 m has I-section 125 mm \times 200 mm \times 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 ^o with respect to vertical and passing through the centroid of the section. Determine the maximum stresses induced at any cross-section of the beam. (10)	5	L2