Enrollment No......................................

Faculty of Engineering
End Sem Examination Dec 2024
CE3ES11 Strength of Material

Programme: B.Tech.   Branch/Specialisation: CE

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	CO	PO	PSO
Q.1	i.	A mild steel wire (E = 2×10^5 N/mm^2) 5 mm in diameter and 1m long. If the wire is subjected to an axial tensile load 10kN then the extension will be: (a) 2.55mm (b) 3.15mm (c) 2.45mm (d) 2.65mm	1	2	3	2	
	ii.	The stress corresponding to breaking point is known as _____. (a) Yield stress (b) Ultimate stress (c) Breaking stress (d) Normal stress	1	2	3	2	
	iii.	Variation of bending stresses in a beam have- (a) Parabolic variation (b) Linear variation (c) Cubical variation (d) None of thes	1	2	2	1	
	iv.	A beam which extends beyond it supports can be termed as _____. (a) Over hang beam (b) Over span beam (c) Isolated beams (d) Tee beams	1	2	2	1	
	v.	Where does neutral axis of column lie in cantilever method? (a) Vertical plane (b) Horizontal plane (c) Both (a) and (b) (d) None of thes	1	2	5	2	
	vi.	Unit of deflection are: (a) kN/m (b) kNm (c) kN (d) M	1	1	2	1	

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P.T.O.

vii. _____ is a measure of the strength of shaft in rotation.   **1** 2 3 2
(a) Torsional-modulus
(b) Sectional-modulus
(c) Polar-modulus
(d) Torsional rigidity

viii. When a shaft is subjected to pure twisting then the type of stress developed is _____.   **1** 2 3 2
(a) Bending   (b) Axial
(c) Shear   (d) Normal

ix. A retaining wall is related to _____.   **1** 2 5 2
(a) Plane stress   (b) Plane strain
(c) Normal stress   (d) Normal strain

x. Long axially loaded columns tends to deflect about _____.   **1** 2 5 1
(a) Moment of inertia
(b) Effective length
(c) Core
(d) Safe loading

Q.2 i. Define Hook's law.   **2** 2 3 1
ii. Explain principle of superposition.   **3** 2 3 2
iii. Explain the following terms-   **5** 2 3 2
(a) Principal planes   (b) Principal stress
(c) Principal strain   (d) Normal stresses
(e) Tangential stresses

OR iv. The principal stress at a point in a bar are 200 N/mm^2 (Tensile) and 100 N/mm^2 (Compressive). Determine the resultant stress in magnitude and direction on plane inclined at maximum intensity of shear stress in the material at the point.   **5** 2 3 2

Q.3 i. Define the term neutral axis and section modulus.   **4** 2 2 2
ii. Differentiate between direct stress and bending stress.   **6** 2 2 2
OR iii. Derive bending equation of a beam.   **6** 2 2 2
Q.4 i. What do you understand by deflection and slope?   **3** 2 2 2

ii. What are various methods to determine slope and deflection of indeterminate beams? Explain any two in detail.   **7** 2 2 2

OR iii. Determine the slope and deflection of simply supported beam of span L m. carrying uniformly distributed load all over the span using Macaulay's method.   **7** 3 2 3

Q.5 i. Define the term hoop stress and longitudinal stress.   **3** 2 4 2
ii. Write down basic assumptions of theory of pure torsion. Also write down torsion equation.   **7** 2 4 2
OR iii. Prove that in case of beam of rectangular cross section the max. Shear stress developed is 3/2 times the average shear stress.   **7** 3 4 3

Q.6   Attempt any two:
i. If the failure stress in the material of a mild steel column is 330 MPa. Euler's formula for buckling load is applicable for slenderness ratio equal to/greater than? (Given E = 200 GPa, σ_{PL}= 250 MPa).   **4** 2 1 3
ii. Explain unsymmetrical bending and Theory of failure.   **6** 2 1 3
OR iii. Define the term-   **6** 2 5 2
(a) Slenderness Ratio
(b) Long Column
(c) Rankine's Formula

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Marking Scheme
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Q.1	i)	A	1
	ii)	C	1
	iii)	B	1
	iv)	A	1
	v)	B	1
	vi)	D	1
	vii)	C	1
	viii)	C	1
	ix)	C	1
	x)	A	1

Q.2	i.	1.5 marks for definition. 0.5 marks for graph	2
	ii.	3 marks for Proper explanation	3
	iii.	1 Mark for each correct definition	5
OR	iv.	1 mark for each step	5

Q.3	i.	2 marks for each definition	4
	ii.	6 marks for 3 points of each	6
OR	iii.	6 marks for correct derivation 1 mark for each step	6

Q.4	i.	3 marks for correct definition & necessary diagram	3
	ii.	3 marks for name and 4 marks for explanation of 2 method	7
OR	iii.	7 marks for correct explanation	7

Q.5	i.	1.5 marks for each definition	3
	ii.	5 marks for Assumptions and 2 marks for equation.	7
OR	iii.	Full marks for complete proof	7

Q.6		4 marks for correct result 1 mark for each step	4
	i.	2 marks for each definition	6
	ii.	2 marks for each definition	6

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