Hall Ticket Number:

Code No. : 14113

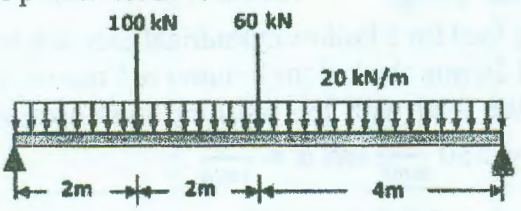
VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.: CBCS) IV-Semester Main & Backlog Examinations, May-2019

Strength of Materials-II

Time: **3** hours Max. Marks: **60**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Q.No.	Stem of the question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	A cantilever beam of span 3 metres is subjected to a point load of 20kN at the free end. **Compute** slope and deflection at the free end.	2	2	1	1
2.	A simply supported beam of span 4m is subjected to a point load of 25kN at the midspan. **Compute** maximum deflection and end-slopes. EI is constant.	2	2	1	1
3.	A propped cantilever beam of span 5 metres is subjected to a uniformly distributed load of 20kN per metre run over the entire span. **Compute** prop reaction.	2	2	1	1
4.	**State** the fixed end moments of a fixed beam of span L subjected to a uniformly distributed load of w per metre run over the entire span.	2	1	1	1
5.	**State** the Clayperon theorem of three moments.	2	1	1	1
6.	**Explain** the concept of shear centre.	2	2	2	1
7.	A shaft of 0.3 m diameter has an allowable shear stress of 70kN/m^2. **Compute** the strength of the shaft.	2	2	3	1
8.	**State** the formula for the deflection of a close coiled helical spring under axial load.	2	1	4	1
9.	A bar of 20mm diameter and length 2m is suddenly subjected to an axial load of 100N. **Compute** the strain energy stored in the bar. E=2×10^{5}N/mm^2	2	2	4	1
10.	**Define** slenderness ratio and explain its significance	2	2	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	**Derive** the expressions for the slope and deflection at the free end of a cantilever beam of span *L* subjected to a uniformly distributed load of *w* per metre run over the entire span. *EI* is constant.	4	2	1	2
b)	**Analyse** the simply supported beam shown in the figure and compute slopes and deflections at typical points. EI is constant. 	4	3	1	2
12. a)	A propped cantilever beam of span L is subjected to a uniformly distributed load of w per metre run. **Draw** the shear force and bending moment diagrams for the beam.	4	4	1	2
b)	A fixed beam of span 4 metres is subjected to a uniformly distributed load over the entire span, in addition to a point load of 75kN at a distance of 1m from the left end. **Compute** the slopes and deflections at salient points and also fixed end moments. EI is constant.	4	2	1	2

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13. a)	A continuous beam has a fixed support at A and roller supports at B and C. Length of span AB is 3 metres and is subjected to a point load of 75kN at midspan while length of span BC is 4 metres and is subjected to a uniformly distributed load of 20kN per metre run. **Draw** the bending moment diagram for the beam.	4	4	1	2
b)	A two-span continuous beam ABC is supported by hinge at A and rollers at B and C. The span AB of length 4m is subjected to a uniformly distributed load of 25 kN/m over the entire span while the span BC of length 3m is subjected to a point load of 45kN acting at a distance of 1m from C. **Draw** the SFD and BMD for the beam.	4	4	1	2
14. a)	**Derive** the governing equation of torsion of circular shafts $\frac{T}{J} = \frac{fs}{R} = \frac{C\theta}{L}$	4	4	3	2
b)	**Derive** an expression for the deflection of a close coiled helical spring n turns with mean radius R, wire diameter d and modulus of rigidity C subjected to an axial load W.	4	4	4	2
15. a)	A weight of 12kN falls by 40mm on a collar rigidly attached to a vertical bar 4m long and 1000 mm2 in cross section. **Compute** the instantaneous expansion of the bar. Adopt E=2×10^5 N/mm^2.	4	2	4	2
b)	**Derive** the formula for Euler's buckling load of a column with both ends pinned.	4	4	5	2
16. a)	**Derive** the expressions for the end slopes and midspan deflection of a simply supported beam of span *L* subjected to a uniformly distributed load *w* per metre run over the entire span. *EI* is constant.	4	4	1	2
b)	**Derive** the expressions for the slope and deflection at the free end of a cantilever beam subjected to a clockwise couple of **Mo** at its free end. EI is constant.	4	4	1	2
17.	Answer any ***two*** of the following:				
a)	**Derive** the Clayperon's theorem of three moments when EI is constant and with no support sinking.	4	4	1	1
b)	A closely coiled helical spring of 150 mm mean diameter is made up of 12 mm diameter wire and has 24 turns. The spring carries an axial load of 150N. If modulus of rigidity is 0.8×10^5 N/mm^2, **compute** the deflection of the spring. Also compute the stiffness of the spring.	4	3	4	2
c)	**Compute** the Euler's crippling load for a hollow cylindrical cast iron column of 220 mm external diameter and 20 mm thick if the column is 5 metres long with both ends hinged. Compare the load with the crushing load obtained using Rankine's formula, taking $\sigma_C = 550\frac{N}{mm^2}$ and $\alpha = \frac{1}{1600}$.	4	2	5	2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	67%
2	Knowledge on application and analysis (Level-3 & 4)	33%
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	--