

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD – 402 103
End Semester Examination – Summer 2019**

Branch: B. Tech in Civil Engineering

Subject Name: Structural Mechanics I

Max. Marks: 60

Date: - 20/05/2019

Semester: IV

Subject Code: BTCVC 403

Duration: 3 Hrs.

Instructions to the Students

1. Attempt any five questions out of the following.
2. The level questions/ expected answer as per OBE or the course outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly. For all numerical use $E = 210 \text{ GPa}$ and $I = 500 \times 10^{-6} \text{ m}^4$ wherever essential.
5. Illustrate your answers with neat sketches, diagram etc., wherever necessary.

		(Level / CO)	Marks
Q. 1 (a)	Define degree of static indeterminacy and degree of kinematic indeterminacy of a structure. Write and explain equation of the degree of static indeterminacy of beam.	L 2	04
Q. 1 (b)	Analyse the beam as shown in figure 1 using Castigliano's theorem and hence find vertical deflection and slope at the free end.	L 4	08

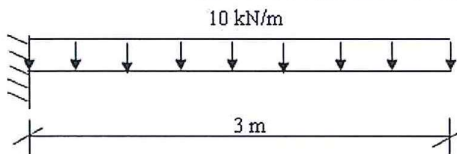


Figure 1

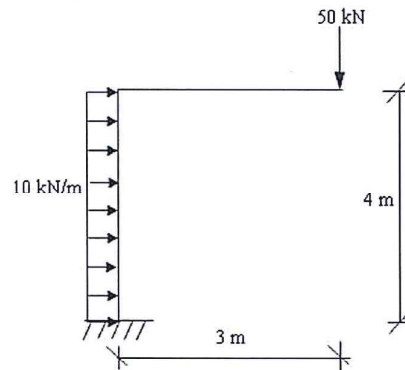


Figure 2

Q. 2	Analyse the rigid jointed frame as shown in the figure 2 using Virtual Work method and hence find the slope and vertical deflection at the free end.	L 4	12
Q. 3 (a)	Analyse the propped cantilever shown in figure 3 using moment area method and hence draw the bending moment diagram. Span of beam is 4 m.	L 4	06

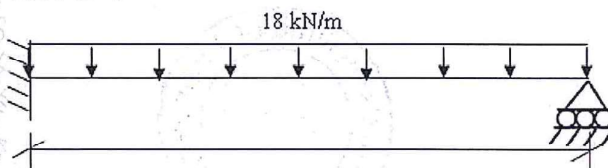


Figure 3

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OR

- Q. 3 (a) A fixed beam of span 10 m carries two point loads of 50 kN and 60 kN acting at 3 m and 6 m from left support. Find the fixed end moments and hence draw SFD and BMD. **L 4 06**
- Q. 3 (b) Analyse the continuous beam as shown in figure 4 using theorem of three moments and hence draw the SFD and BMD. **L 4 06**

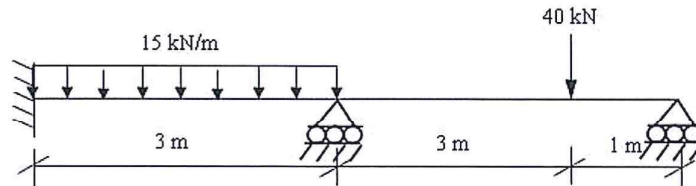


Figure 4

- Q. 4 Analyse the rigid frame as shown in figure 5 using slope deflection method and hence draw the BMD. I of columns = $2I$ of beam. The downward settlement of foundation at right side is 10 mm. **L 4 12**

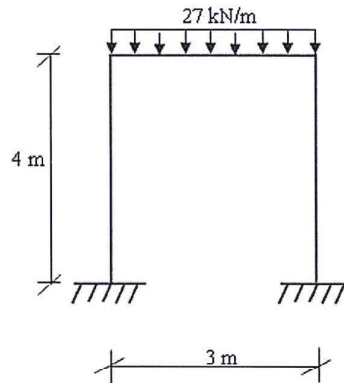


Figure 5

OR

- Q. 4 Analyse the continuous beam as shown in figure 6 using Slope Deflection method and hence draw SFD and BMD. EI = constant. **L 4**

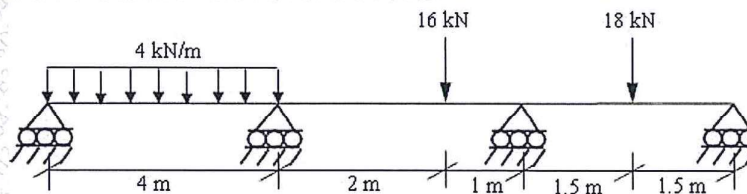


Figure 6



- Q.5 Analyse the beam as shown in figure 7 using Moment Distribution method and hence draw SFD and BMD. L 4 12

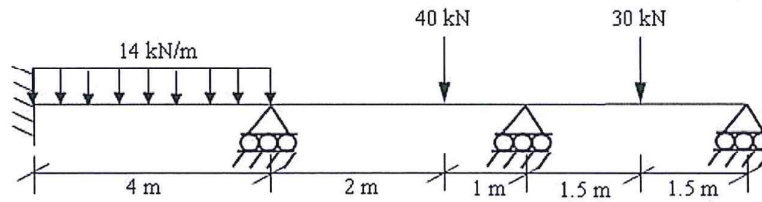


Figure 7

- Q.6 (a) Wall thickness of a cylindrical shell of 800 mm internal diameter and 2 m long is 10 mm. If the shell is subjected to an internal pressure of 2 MPa, find circumferential stress, longitudinal stress and maximum shear stress. L 4 06
- Q.6 (b) A cast iron pipe of 240 mm inside diameter and 15 mm thickness is closely wound with a layer of 4 mm diameter steel wire under a stress of 30 MPa. Find the stresses in the pipe and the steel wire when water is admitted into the pipe at a pressure of 4 MPa. For steel $E = 210$ GPa, cast iron $E = 105$ GPa, Poisson's ratio is 0.3. L 4 06

OR

- Q.6 (b) A cylindrical shell of length 1m and internal diameter 150 mm has a thickness of 10 mm. If the shell is subjected to internal pressure of 3 N/mm², find change in diameter, change in length and change in volume. $E = 210$ GPa, $\mu = 0.3$. L 4 06

END