Q.5	i.	State the Muller Breslau principle.	**2**
	ii.	Four-point loads 8, 15, 15 and 10 kN have centre to centre to spacing of 2 m between the consecutive loads and they traverse a girder of span 30 m from left to right with 10 kN load leading. Draw the ILD for shear force at a section 8 m from the left support. Also calculate maximum +ve and –ve shear force at the section using ILD.	**8**
OR	iii.	An UDL of intensity 40 kN/m and 5 m long crosses a simply supported girder of span 15 m from left to right. Calculate maximum bending moment at a section 6 m from the left support. Also calculate maximum (absolute maximum) bending moment in girder.	**8**
Q.6	i.	Draw a neat sketch of the suspension bridge.	**2**
	ii.	A symmetrical three hinged circular arch has a span of 24 m and a rise to the central hinge of 6 m. It carries an UDL of 10 kN/m on left half span. Find the maximum positive and negative bending moment.	**8**
OR	iii.	A parabolic arch, hinged at the ends only has a span 30 m and rise 5 m. A concentrated had of 12 kN acts at 10 m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Also calculate the maximum +ve bending moment anywhere on the arch.	**8**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination May-2023
CE3CO23 Structural Analysis -I

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.

Q.1	i.	The static indeterminacy of a Fixed Beam is- (a) 0 (b) 1 (c) 2 (d) 3	**1**
	ii.	The kinematic indeterminacy of a Propped cantilever Beam considering the beam is axially rigid is- (a) 0 (b) 1 (c) 2 (d) 3	**1**
	iii.	Three moment theorem is a- (a) Displacement Method (b) Force method (c) Both (a) and (b) (d) None of these	**1**
	iv.	The effect of change in temperature in determinate truss is to produce- (a) Displacement at the joints (b) Additional forces in members (c) Both (a) and (b) (d) None of these	**1**
	v.	The carry – over factor when far end being simply supported is- (a) 0 (b) ½ (c) 1 (d) All of these	**1**
	vi.	The distribution factor at fixed support is- (a) 0 (b) 1 (c) 2 (d) 3	**1**
	vii.	The bending moment at every section in a symmetrical 3-hinged parabolic arch with central hinge subjected to UDL over whole span is- (a) Zero (b) Constant (c) Variable (d) All of these	**1**
	viii.	The 2-hinged parabolic arch is a (a) Statically determinate structure (b) Single degree Statically indeterminate structure (c) Two degree Statically indeterminate structure (d) Unstable structure	**1**

P.T.O.

ix. The maximum (Absolute maximum) shear force always occurs at- **1**

(a) Supports (b) The centre of span

(c) The quarter of span (d) None of these

x. The maximum (Absolute maximum) bending moment in a simply supported beam of span L subjected to UDL (w) longer than span is **1**

(a) $\frac{wL^2}{8}$ at every section

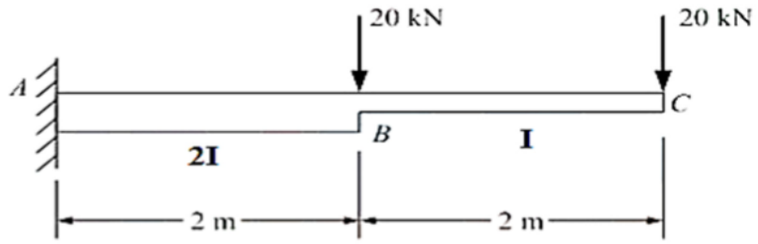
(b) $\frac{wL^2}{8}$ at supports

(c) $\frac{wL^2}{8}$ at quarter span

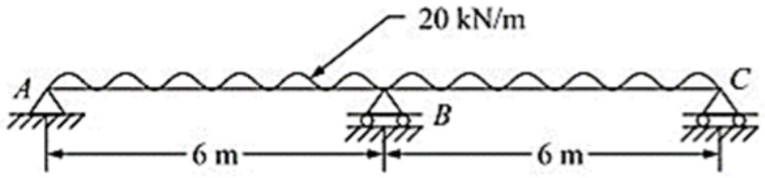
(d) $\frac{wL^2}{8}$ at centre of span

Q.2 i. State the Maxwell's reciprocal theorem. **2**

ii. Determine the vertical deflection and rotation at free end of cantilever beam as shown in figure. Take E = 200 KN/mm^2 & I = 12 x 10^6 mm^4 **8**

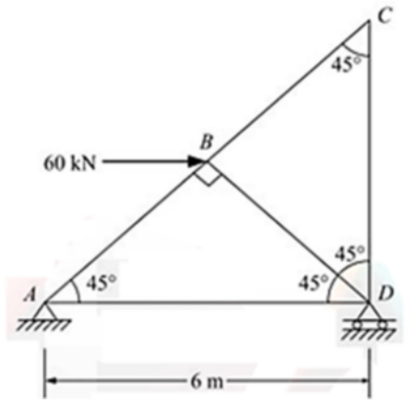


OR iii. Analyze the beam as shown in figure by consist deformation method and draw BMD. **8**

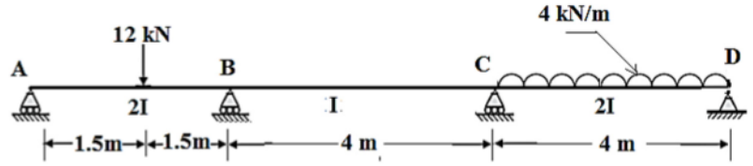


Q.3 i. Explain the effect of temperature and lack of fit in determinate and redundant truss. **2**

ii. Determine the horizontal deflection at point "C" in a truss as shown in figure. The member BC is subjected to rise of temperature of 15^{0}C. All the members have the same cross- sectional area of 600 mm^2 and modulus of elasticity E = 2 x 10^5 N/mm^2. Take α = 12*10^{-6} / ^{0}C. **8**

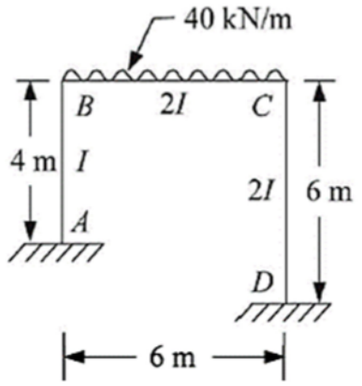


OR iii. Analyse the continuous beam as shown in figure by three moment equation and draw BMD. **8**

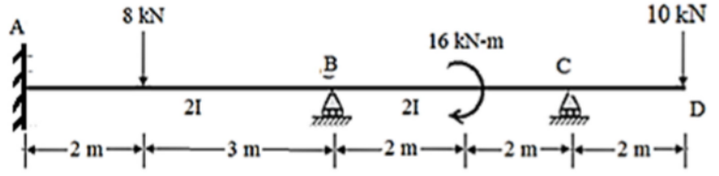


Q.4 i. Explain the terms Carry over factor and Distribution factor. **2**

ii. Analyze the portal frame as shown in figure by Slope Deflection method and draw BMD. **8**



OR iii. Analyse the following continuous beam as shown in figure if supports A, B & C sink by 2 cm, 4 cm & 3 cm respectively by Moment Distribution Method. Take EI = 3000 kN-m^2. Draw BMD. **8**



Marking Scheme

CE3CO23[T] Structural Analysis-I

Q.1	i)	(d) 3	**1**
	ii)	(b) 1	**1**
	iii)	(b) Force method	**1**
	iv)	(a) Displacement at the joints	**1**
	v)	(a) 0	**1**
	vi)	(b) 1	**1**
	vii)	(a) Variable	**1**
	viii)	(b) Single degree Statically indeterminate structure	**1**
	ix)	(a) supports	**1**
	x)	(d) $\frac{wL^2}{8}$ at centre of span	**1**
Q.2	i.	Statement of the Maxwell's reciprocal theorem	**2**
	ii.	Vertical deflection at free end	**4**
		Rotation at free end	**4**
OR	iii.	Analysis of beam	**5**
		Bending Moment Diagram	**3**
Q.3	i.	effect of temperature and lack of fit in determinate truss	**1**
		effect of temperature and lack of fit in redundant truss	**1**
	ii.	Determination of forces (P) in all the members of truss due to external load	**3**
		Determination of forces (k) in all the members of truss due to unit load applied horizontally at C	**3**
		Calculation for deflection at C	**2**
OR	iii.	Apply 3 moment equation for span AB & BC	**2**
		Apply 3 moment equation for span BC & CD	**2**
		Calculation for BM at B & C	**2**
		Bending Moment Diagram	**2**
Q.4	i.	Definition of Carry over factor	**1**
		Definition of Distribution factor.	**1**
	ii.	Determination of Fixed end moments	**1**
		Slope-deflection equation for span AB,BC & CD	**1**
		Formulation of equilibrium equation	**2**
		Determination of slope at B & C and sway	**1**
		Determination of final end moment	**1**
		Bending Moment Diagram	**2**
OR	iii.	Determination of Fixed end moments	**2**
		Determination of Distribution factor	**1**
		Moment distribution table	**3**
		Bending Moment Diagram	**2**
Q.5	i.	Statement of the Muller Breslau principle.	**2**
	ii.	Drawing the ILD for shear force at a	**2**
		Calculation of maximum +ve shear force at the section using ILD.	**3**
		Calculation of maximum –ve shear force at the section using ILD.	**3**
OR	iii.	Calculation of maximum bending moment at a section	**4**
		Calculation maximum maximum (absolute maximum) bending moment in girder.	**4**
Q.6	i.	Neat sketch of the suspension bridge with proper nomen cloture.	**2**
	ii.	Determination of vertical reaction at supports	**2**
		Determination of horizontal reaction at supports	**1**
		Maximum +ve BM	**3**
		Maximum –ve BM	**2**
OR	iii.	Determination of vertical reaction at supports	**2**
		Determination of horizontal reaction at supports	**3**
		Maximum +ve BM	**3**

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