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.

Q.1   i.   The degree of indeterminacy of the beam shown in Fig.1 (i) is: **1**

Fig. 1 (i)

(a) 2   (b) 3   (c) 4   (d) 6

ii.   Fig.1 (ii) shows a frame to be analysed by MDM. The Distribution   **1**
factor for Members EB, ED and EF will be respectively:

Fig. 1 (ii)

(a) 2/9, 4/9, 1/3   (b) 8/13, 3/13, 4/13
(c) 3/10, 4/10, 3/10   (d) 4/11, 4/11, 3/11

iii.   The systematic development of slope deflection method in the   **1**
matrix form is known as:
(a) Stiffness matrix method   (b) Displacement matrix method
(c) Equilibrium method   (d) All of these

iv.   Flexibility Matrix method is known as: **1**
(a) Force method   (b) Compatibility method
(c) Displacement method   (d) Equilibrium method

Q.4   i.   What are the Assumptions made in Cantilever Method?   **3**

ii.   Analyse the frame shown in Fig. 4 and evaluate approximately the   **7**
column end moments, beam end moments and reactions by Portal Method.

OR   iii.   Analyse the frame shown in Fig. 4 and evaluate approximately the   **7**
column end moments, beam end moments and reactions by Cantilever Method.
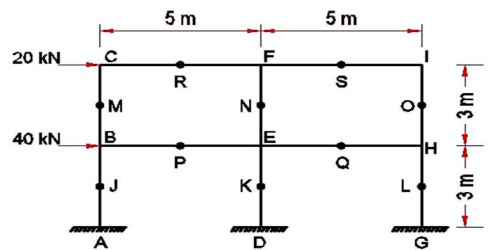

Fig. 4

Q.5   i.   Explain Muller Breslau Principle with neat diagram.   **3**

ii.   The beam is loaded with two loads 25 kN each spaced at 2.5 m is   **7**
travelling on the beam having span of 10 m. Find the absolute maximum moment.

OR   iii.   For a propped Cantilever Beam AB Fixed at End A, draw   **7**
influence line for reaction at A, Reaction at B, Moment at Fixed End A. Provide Co-ordinates at 1m intervals.

Q.6   i.   Define: **3**
(a) Plastic Hinge   (b) Load Factor

ii.   Define Shape Factor. Calculate the shape factor for a rectangle   **7**
section of breadth b and depth d.

OR   iii.   Evaluate the collapse load for the frame shown in the Fig. 6, Mp is   **7**
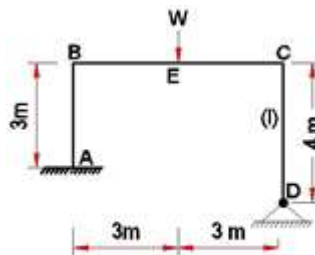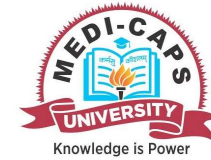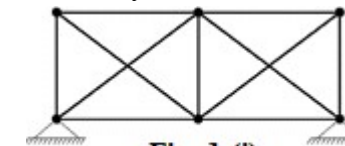the same for all members.

Fig. 6

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v. Which types of forces are generated during earthquake? **1**
(a) Vertical shear   (b) Horizontal shear
(c) Bending moment   (d) Combination of (a) and (b)

vi. How many assumptions do we have to make to solve an indeterminate truss? **1**
(a) Always three
(b) Always two
(c) Equal to its degree of indeterminacy
(d) One less than its degree of indeterminacy

vii. For drawing ILD, what value of test load is assumed? **1**
(a) One unit   (b) Arbitrary
(c) Depends upon structure   (d) 0

viii. What will be the ILD equation for ILD of shear at point D? **1**
(a) -0.43 + 0.16625X   (b) -0.33 + 0.16625X
(c) -0.53 + 0.16625X   (d) -0.33 + 0.216625X

ix. The moment which makes all the fibre at the section to yield is known as: **1**
(a) Flexural rigidity   (b) Moment of resistance
(c) Plastic moment capacity   (d) Yield moment

x. In plastic analysis of structures the following assumptions are made: **1**
I. plane section before bending remains plane even after bending
II. The relationship between compressive stress and compressive strain is the same as between tensile stress and tensile strain.
III. the deflection are small
Select the correct answer code from below
(a) I and II are true but III is wrong
(b) I and III are true but II is wrong
(c) II and III are true but I is wrong
(d) I, II and III are true

Q.2   i. Define and formulate kinematic and static indeterminacy. **3**
    ii. Solve the Frame in Fig. 2 (ii) by moment distribution method. Draw BMD and SFD. **7**
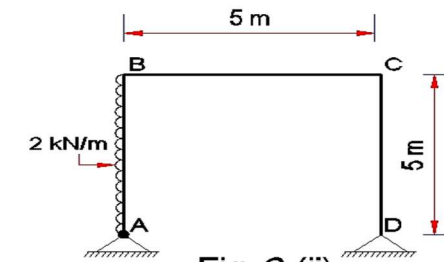
Fig. 2 (ii)

OR   iii. Solve the Continuous Beam in Fig. 2 (iii) by Kani's Method. Draw BMD and SFD. **7**
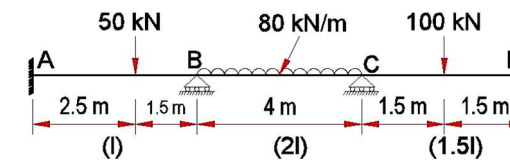
Fig. 2 (iii)

Q.3   i. Differentiate displacement methods and force methods. Also enlist various methods. **3**
    ii. Examine the continuous beam ABC shown in Fig. 3 (ii) below by stiffness method and also draw the bending moment and shear force diagram. **7**
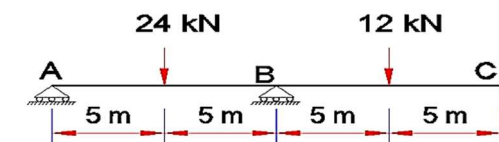
EI = Constant
Fig. 3 (ii)

OR   iii. Examine the continuous beam ABC shown in Fig. 3 (iii) below by Force method and also draw the bending moment and shear force diagram. **7**

EI = Constant
Fig. 3 (iii)

P.T.O.

Q.1 i.   The degree of indeterminacy of the beam shown in Fig.1 (i) is: **1**
          (b) 3

     ii. Fig.1 (ii) shows a frame to be analysed by MDM. The Distribution   **1**
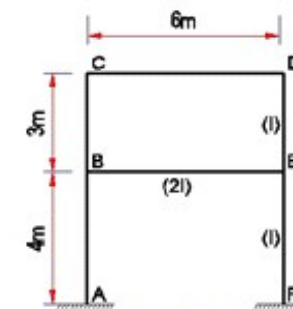   factor for Members EB, ED and EF will be respectively:
          (d) 4/11, 4/11, 3/11

     iii. The systematic development of slope deflection method in the   **1**
          matrix form is known as:
          (d) All of these

     iv. Flexibility Matrix method is known as: **1**
          (a) Force method

     v.   Which types of forces are generated during earthquake?   **1**
          (b) Horizontal shear

     vi. How many assumptions do we have to make to solve an   **1**
          indeterminate truss?
          (c) Equal to its degree of indeterminacy

     vii. For drawing ILD, what value of test load is assumed?   **1**
          (a) One unit

     viii. What will be the ILD equation for ILD of shear at point D?   **1**
          (b) -0.33 + 0.16625X

     ix. The moment which makes all the fibre at the section to yield is   **1**
          known as:
          (c) Plastic moment capacity

     x.   In plastic analysis of structures the following assumptions are   **1**
          made:
          I.   plane section before bending remains plane even after bending
          II. The relationship between compressive stress and compressive
               strain is the same as between tensile stress and tensile strain.
          III. the deflection are small
          Select the correct answer code from below
          (d) I, II and III are true

Q.2 i.   Kinematic   **3**
          Definition   1 Mark
          Formula   0.5 Mark
          Static indeterminacy
          Definition   1 Mark
          Formula   0.5 Mark

     ii. Fixed end moments   1 Mark   **7**
          Distribution factor   1 Mark
          Non-sway analysis   1.5 Marks
          Sway analysis   1.5 Marks
          Result calculations   1 Mark
          BMD and SFD   1 Mark

OR   iii. Fixed end moments   1 Mark   **7**
          Rotation factor   1 Mark
          Iteration diagram   2 Marks
          Final moment calculations   2 Marks
          BMD and SFD   1 Mark

Q.3 i.   Difference   2 Marks   **3**
          List of methods   1 Marks

     ii. Stiffness method   **7**
          Indeterminacy   1 Mark
          Redundant structure   1 Mark
          Stiffness matrix   2 Marks
          Formulation of matrix statement   1 Mark
          Results   1 Mark
          BMD and SFD   1 Mark

OR   iii. Force method   **7**
          Indeterminacy   1 Mark
          Redundant structure   1 Mark
          Flexibility matrix   2 Marks
          Formulation of matrix statement   1 Mark
          Results   1 Mark
          BMD and SFD   1 Mark

Q.4 i.   1.5 Marks for each assumption   (1.5 Marks*2) **3**
     ii. Portal method   **7**
          Frame diagram with assumption points and values
                                                  1 Mark
          Calculations   5 Marks
          Results   1 Marks

OR   iii. Cantilever Method   **7**
          Frame diagram with assumption points and values
                                                  1 Mark
          Calculations   5 Marks
          Results   1 Marks

Q.5	i.	Definition	2 Marks	**3**
		Diagram	1 Mark	
	ii.	Load placement	2 Marks	**7**
		Calculations	5 Marks	
OR	iii.	ILD coordinates with support reaction Rb	2 Marks	**7**
		ILD coordinates with support reaction Ra	2 Marks	
		ILD coordinates for moment A	2 Marks	
		Diagram	1 Mark	
Q.6	i.	(a) Plastic Hinge	1.5 Marks	**3**
		(b) Load Factor	1.5 Marks	
	ii.	Definition Shape Factor		**7**
		Calculation-shape factor of rectangle	5 Marks	
OR	iii.	Mechanism	2 Marks	**7**
		Calculations	5 Marks	