

S.No. : 467

BCE 2401

No. of Printed Pages : 05

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 23105

Roll
No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B. Tech. Examination 2021-22

(Even Semester)

STRUCTURAL ANALYSIS - I

Time : Three Hours]

[Maximum Marks : 60

Note :- Attempt all questions.

SECTION - A

1. Attempt all parts of the following : 8×1=8

- (a) State degree of freedom.
- (b) Define perfect frame.
- (c) What is statically indeterminate structure?
- (d) What do you mean by rolling load? Explain.
- (e) What is perfect truss?

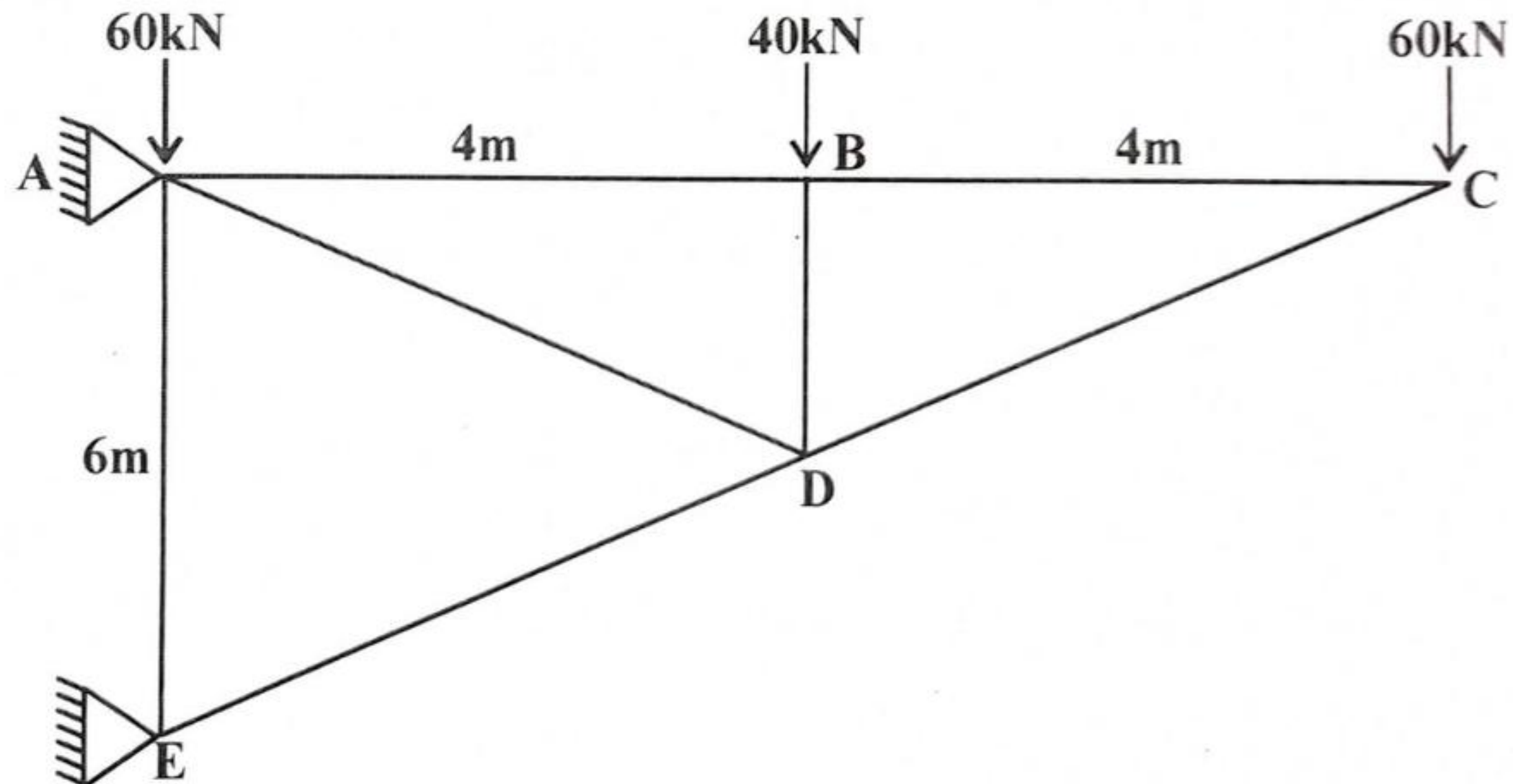
[P. T. O.

- (f) Name the type of forces and support on which the anchors cable and towers depends?
- (g) Write statement of Cartigliano's first theorem.
- (h) Explain the method of joints for analysis of pin jointed structures.

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

- (a) Analyse the frame by method of joints :



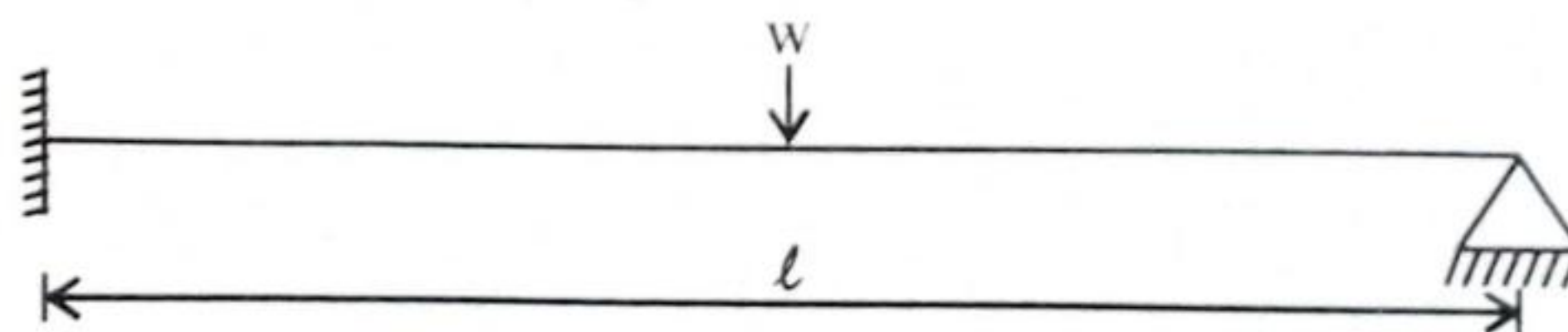
- (b) A parabolic three hinged arch of span ' l ' m is subjected to a UDL of w per meter run over the entire span. Find the horizontal thrust and bending moment at any section $x - x$.

- (c) Find the maximum bending moment and the shear force at 5m from the left support of a simply supported girder of span 14 m when a train of 4 wheel load of 15 kN, 20 kN, 25 kN and 30 kN spaced at 3m, 3m, 4m respectively cross the span with the 16 kN load leading. Using influence line diagram for the same.
- (d) A suspension cable of span 200 m and dip 15 m carries a UDL of 15 kN/m of horizontal span over the full span. If the cable is passed through smooth pulley find the vertical and horizontal forces transmitted to the supporting pylons.

SECTION – C

Note :- Attempt all questions. Attempt any two parts from each questions. $5 \times 8 = 40$

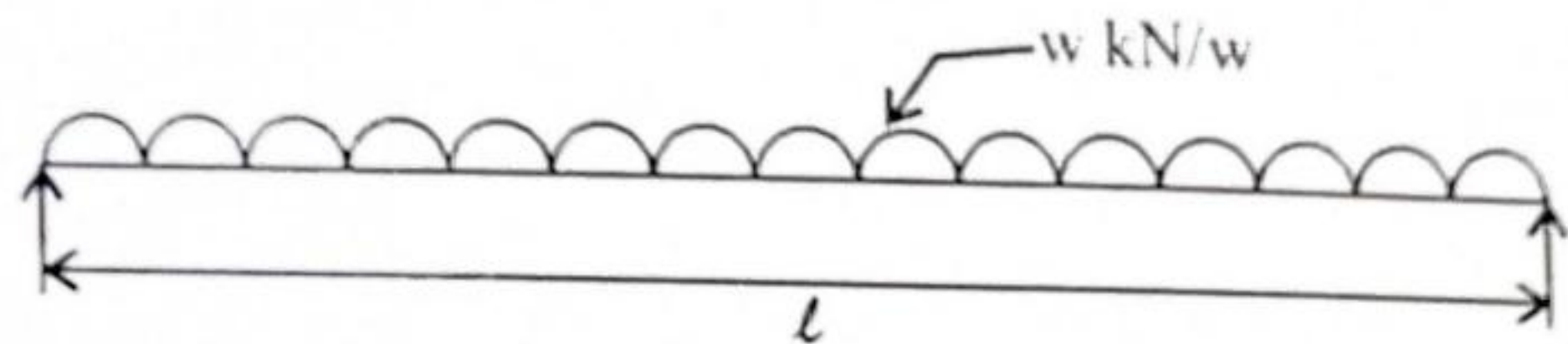
3. (a) Define static and kinetic indeterminacy. Also define both for the given figure :



- (b) State and prove Eddy's theorem.

[P. T. O.]

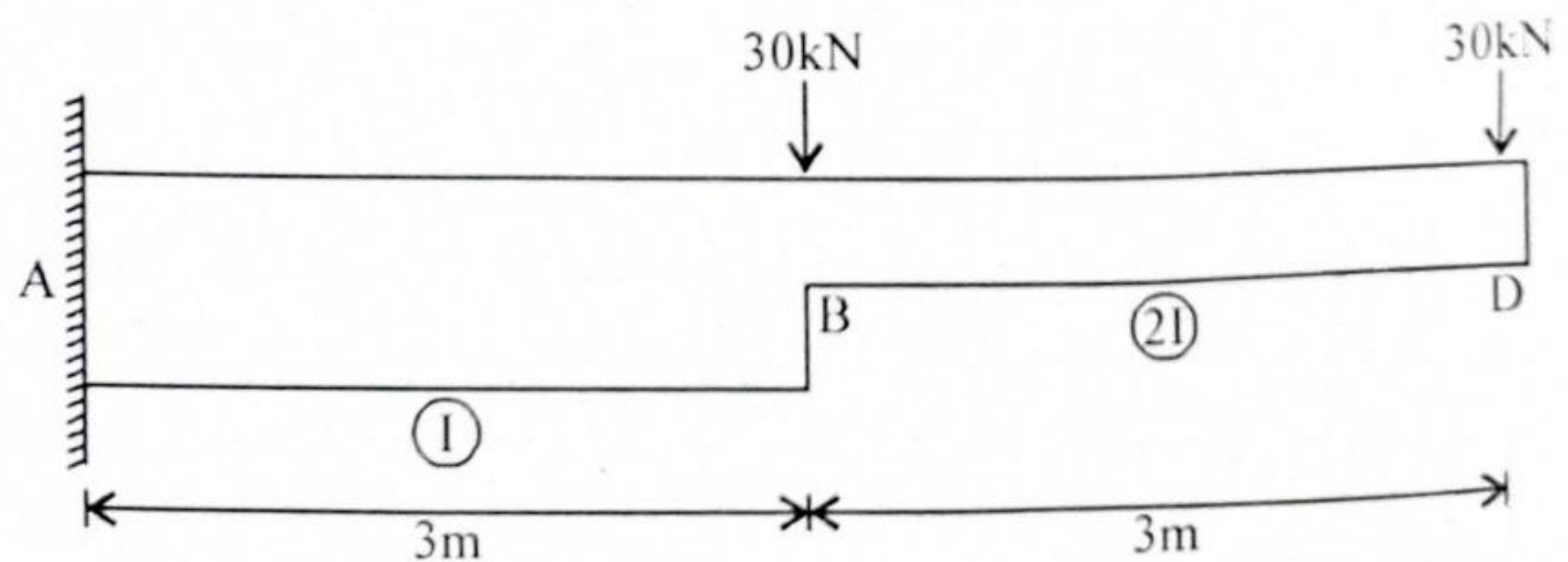
- (c) Calculate the deflection at mid span of a simply supported beam of length L carrying a UDL of w Kn/m. Assume EI is uniform for the beam :



4. (a) State and prove Maxwell's reciprocal theorem.
 (b) Determine the deflection at free end as shown in figure. Use unit load method :

$$E = 2 \times 10^5 \text{ N/mm}^2$$

$$I = 12 \times 10^6 \text{ mm}^4$$



- (c) A parabolic three hinged arch carries a UDL of 50 kN/m on the left half of the span. It has a span of 20 m and a rise of 5 m . Determine the resultant reactions at supports and bending moment at 3 m from left support.

5. (a) State and prove Cartegtiano's theorem. Also discuss its limitations.
- (b) A three hinged stiffening girder of a suspension bridge of span 150 m is subjected to two point loads of 180 kN and 240 kN at distance 30 m and 80 m from left end. Find the bending moment and shear force for the girder at a distance of 50 m from left end. The central dip is 15 m.
- (c) Three wheel loads 30 kN, 90 kN and 90 kN spaced 5.0 m apart from each other with the 30 kN in the lead, pass over a simply supported beam of span 24 m. Determine the maximum shear force and bending moment at a point 10 m from the left support.
6. (a) Explain Betti's law with suitable example.
- (b) With the help of clear example explain complex and compound space trusses.
- (c) A three hinged arch of span 60 m and rise 8m carries concentrated load of 250 kN and 300 kN at distance of 10 m and 20 m from the left end. Find the horizontal thrust if the UDL of 60 kN/m acts on the right half of the span.

