(v) A cantilever beam of length l carries a point load P at its free end. Vertical displacement of its free end will be
(a) $Pl^3/3EI$ (b) $Pl^4/3EI$ (c) Pl/3EI (d) 3Pl/EI.

(vi) If in a pin-jointed plane truss (m + r) < 2j, then the truss is (where 'm', 'r' and 'j' are standard notations)
(a) statically determinate (b) statically indeterminate
(c) unstable (d) stable.

(vii) For any statically indeterminate structure, the redundant should be such as to make the total internal energy within the structure should be
(a) maximum (b) minimum
(c) increasing and then decreasing (d) decreasing and then increasing.

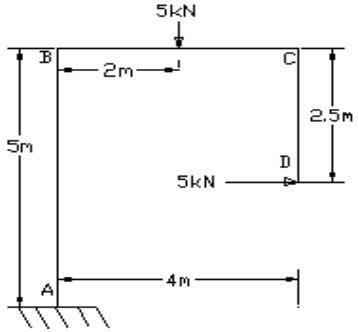
(viii) The three moments equation is applicable only when
(a) the beam is prismatic
(b) there is no settlement of supports
(c) there is no discontinuity within the span
(d) the spans are equal.

(ix) For a two-hinged arch if one of the support settles down vertically, then the horizontal thrust is
(a) increased (b) decreased
(c) remains unchanged (d) becomes zero.

(x) Muller Breslau's principle for obtaining the influence lines is applicable to
(a) trusses
(b) statically determinate structures
(c) statically indeterminate structures
(d) material which is elastic and follows Hookes's law.

Group – B

2. A portal frame ABCD has its end A fixed while the end D is free. Determine the horizontal displacement of D by Castigliano's theorem. EI of all the members is constant. Dimensions are in meters unless otherwise specified.



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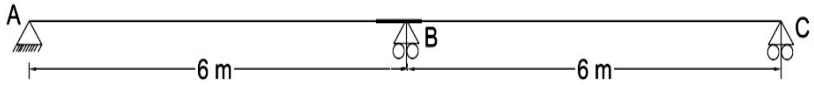
Group – E

8. Using Muller-Breslau principle, compute the influence line ordinates at 1m intervals for reaction RB for the continuous beam ABC as shown in the figure and draw the influence line diagram. Take EI is constant throughout the span.



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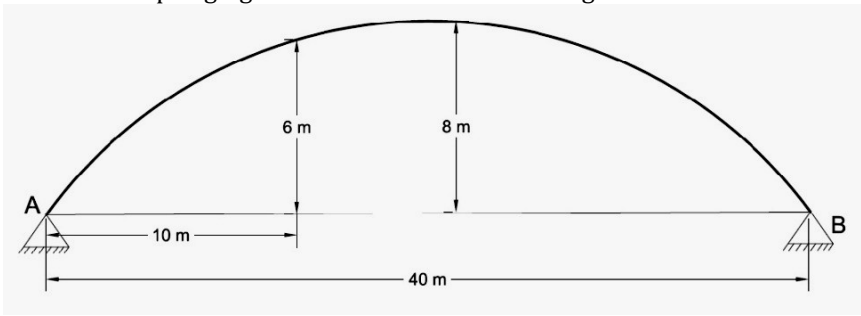
9. A two hinged parabolic arch of span 40m and rise 8m. Compute the ordinates at every 4m interval and draw the influence line diagrams for horizontal reaction, bending moment and shear force at distance 10m from the left hand springing. Assume EI is constant throughout.



12

B.TECH/CE/4TH SEM/CIVL 2201/2019

ANALYSIS OF STRUCTURES - I
(CIVL 2201)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

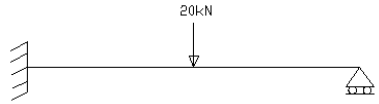
Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

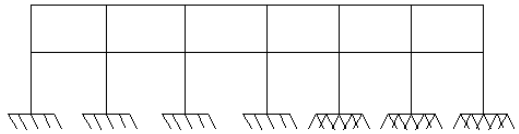
1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Find out the degree of kinematic indeterminacy of the following:



(a) 4 (b) 3 (c) 2 (d) 1.

(ii) Find out the degree of static indeterminacy of the following 2D frame.

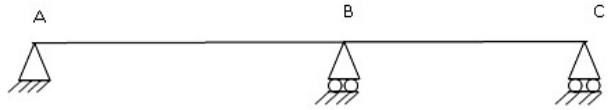


(a) 51 (b) 42 (c) 36 (d) 68.

(iii) When a point load moves from right to left over a beam, then the maximum bending moment occurs at the mid span when the position of the load is

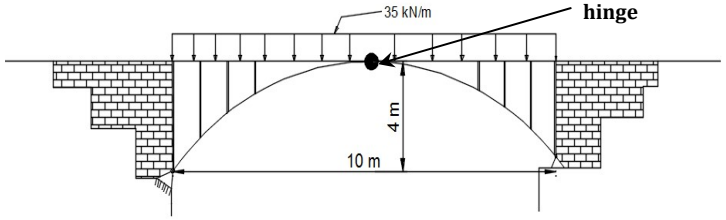
(a) over the left support (b) at 1/3rd point from left end
(c) exactly at the middle point (d) over the right support.

(iv) The static degree of indeterminacy of the given beam is

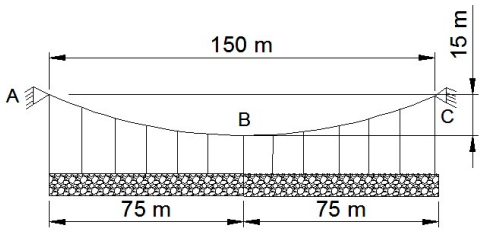


(a)1 (b) 2 (c) 3 (d) 0.

3. (a) Find out the support reactions at the two ends and also the developed bending moment at a section, situated at 4m from left end of the following three hinged arch, where the third hinge is at the crown, at the mid-section.



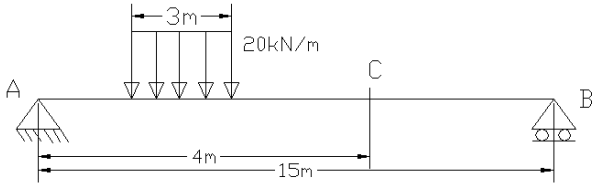
(b) The cable in the following figure carries a concrete beam having 350 mm thick and 4m wide throughout. Density of concrete is 25 kN/m^3. Determine the tension in the cable at point A and B only under the self-weight of the beam.



6 + 6=12

Group – C

4. Prepare the ILD for reaction forces, shear force and bending moment at section C. Evaluate the maximum value of shear and bending moment that can develop at section C under a uniformly moving load of 20kN/m moving from left end to right end having a length of 3m. Assume suitable data if not provided.



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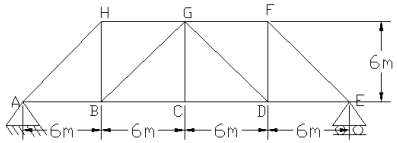
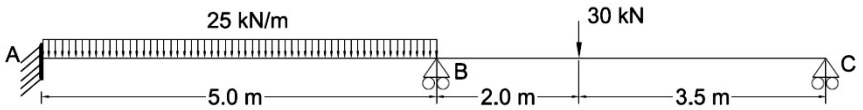
5. Construct the influence line diagram for the force in members AH, AB and BH of the truss shown below.



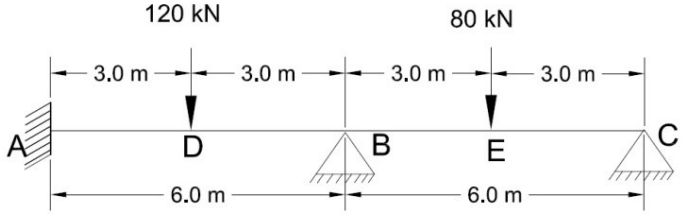
12

Group – D

6. (a) Analyze the continuous beam by three moment theorem. Draw BMD and SFD. Consider support B settles by 10 mm. EI is constant for both the span. E=200×10^6 kN/m^2 and I=400×10^{-6} m^4.

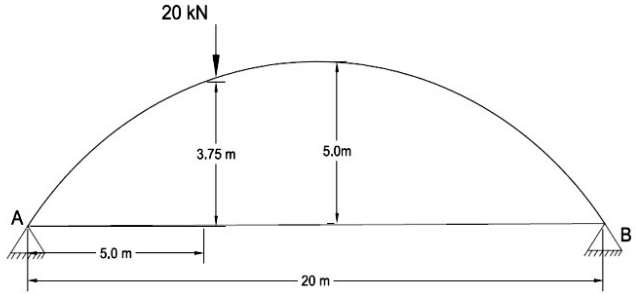


(b) Analyze the continuous beam by Castigliano's theorem. Find all the support reactions. Assume EI is constant throughout.

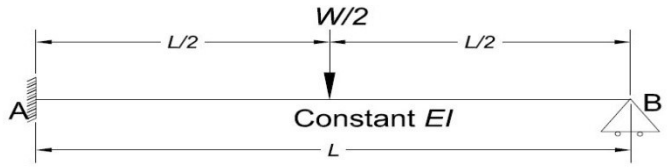


6 + 6 = 12

7. (a) A two hinged parabolic arch of 20m span and central rise 5m carries a point load of 20kN at a distance 5m from the left support. Find the reaction at the support and draw the bending moment diagram. Assume EI is constant throughout.



(b) Analyze by the force method and draw the shear and moment diagram for the beam as shown in figure below.



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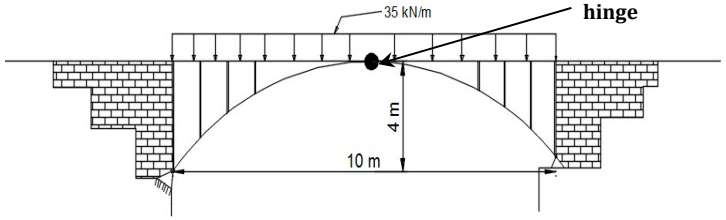

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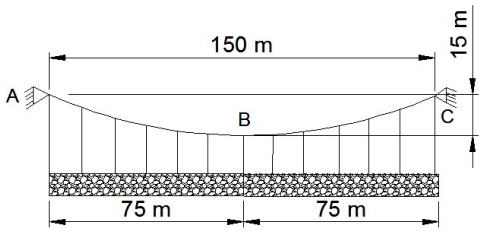

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Group – C

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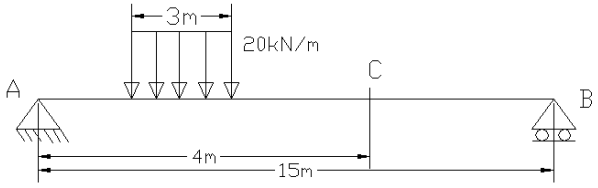

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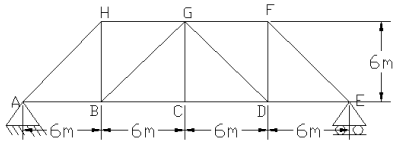

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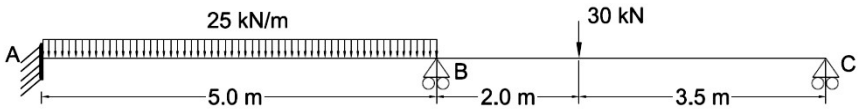

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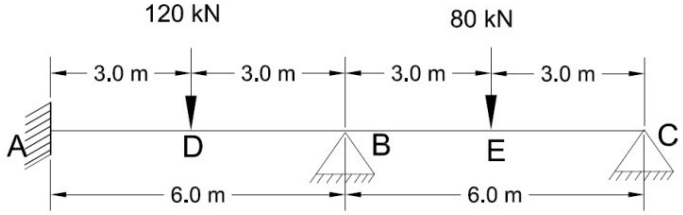

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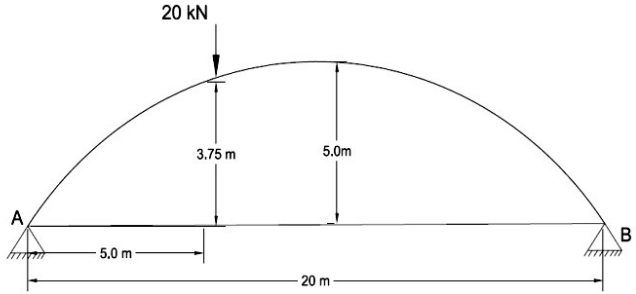

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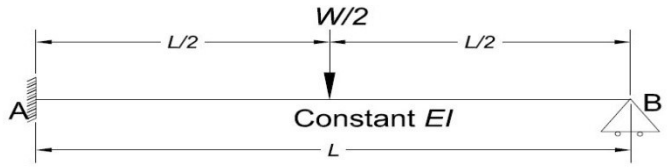

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