

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH (CE)/NEW/SEM-4/CE-402/2013**

**2013**

**STRUCTURAL ANALYSIS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

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

**GROUP – A**

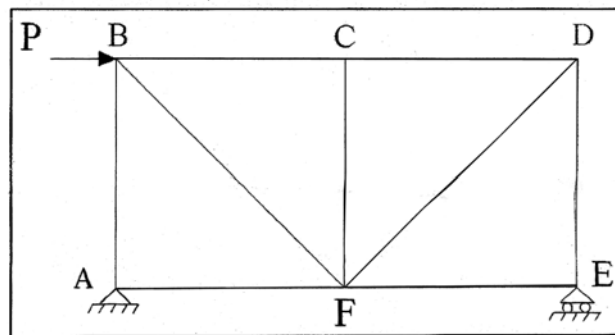
**( Multiple Choice Type Questions )**

1. Choose the correct alternative for any *ten* of the following :

$$10 \times 1 = 10$$

- i) In the moment area method, the difference in slope between any two sections of a loaded member is equal to the
- a) Area of the  $M/EI$  diagram between these two sections.
  - b) Moment of the  $M/EI$  diagram between these two sections about the second section.
  - c) Half of the area of the  $M/EI$  diagram between these two sections.
  - d) Moment of the  $M/EI$  diagram between these two sections about the first section.

- ii) Maxwell's reciprocal theorem in structural analysis can be applied to :
- a) all elastic structures
  - b) plastic structures
  - c) symmetrical structures only
  - d) none of these.
- iii) In the truss as shown, the no-force members are



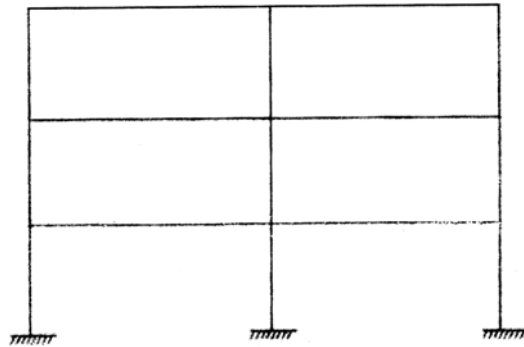
- a) AF, CF
  - b) AF, AB
  - c) CF, EF
  - d) CF, AB.
- iv) The deflection at any point of a perfect frame can be obtained by applying a unit load in :
- a) vertical direction
  - b) the direction in which the deflection is required
  - c) horizontal direction
  - d) none of these.
- v) A rigid jointed plane frame is stable and statically determinate if
- a)  $(m + r) = 2j$ .
  - b)  $(m + r) = 3j$
  - c)  $(3m + r) = 3j$
  - d)  $(m + 3r) = 3j$ .

\* Notations have their usual meaning.

- vi) Slope at the free end of a cantilever beam of span 1 and loaded with a u.d.l. of  $w$  per unit length is

a)  $wl^3/8EI$                       b)  $wl^3/4EI$   
c)  $wl^3/6EI$                       d)  $wl^3/3EI$ .

- vii) What is the Statical Indeterminacy of the frame shown below



a) 9                                      b) 12  
c) 18                                    d) none of these.

- viii) Influence line diagram is applicable for

a) moving load                      b) dead load  
c) both (a) and (b)                d) none of these.

- ix) Under a uniformly distributed load a cable takes the shape of a

a) Parabola                            b) Circular  
c) Catenary                            d) Funicular polygon.

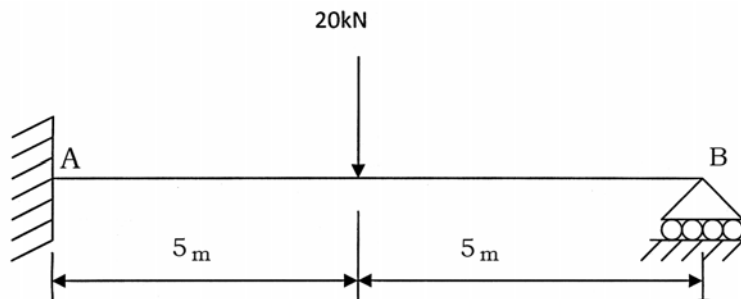
- x) The Castigliano's second theorem can be used to compute deflections
- a) In statically determinate structures only
  - b) For any type of structure
  - c) For beams and frames only
  - d) At the point under the load only.
- xi) Moment Distribution method is a
- a) Force Method
  - b) Elastic Method
  - c) Displacement Method
  - d) None of these.
- xii) The deflection at the mid span of a simply supported beam of span  $2L$  and flexural rigidity  $EI$  subjected to central point load  $P$  is
- a)  $PL^3/3EI$
  - b)  $PL^3/8EI$
  - c)  $PL^3/48EI$
  - d)  $PL^3/6EI$ .

**GROUP – B**

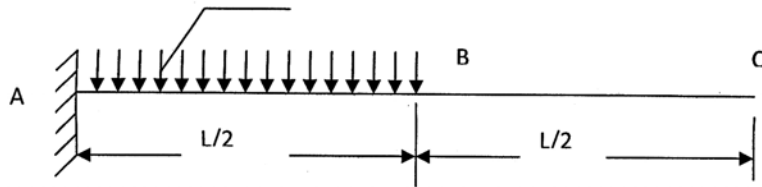
**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

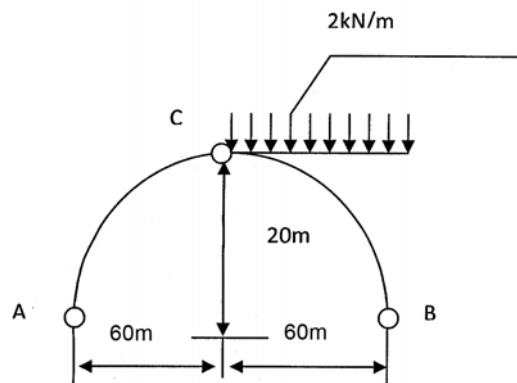
2. Analyse the propped cantilever beam shown below by “consistent deformation method”.



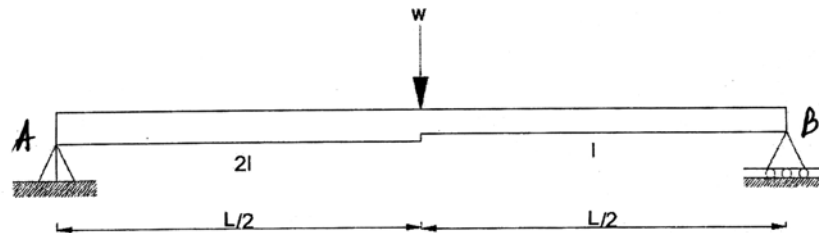
3. Find the rotation and deflection at the free end in the cantilever beam as shown below w/unit length



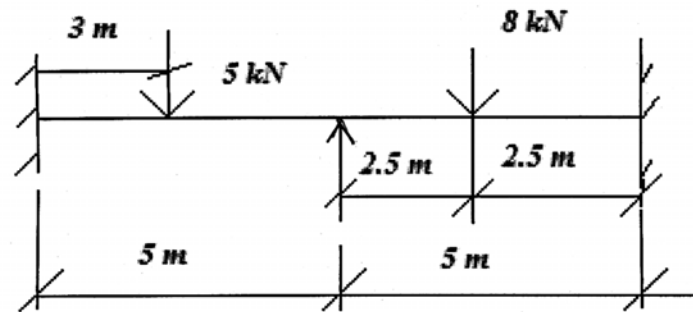
4. A three hinged parabolic arch of span 120m and rise 20 m carries a uniformly distributed load of 2kN/m length on the right half as shown in the fig. below. Determine the maximum bending moment.



5. Find out the slope and deflection at mid point of the beam as shown in Fig below apply 'Conjugate Beam method'.



6. Analyse the continuous beam as shown below by “slope deflection method”. EI constant.

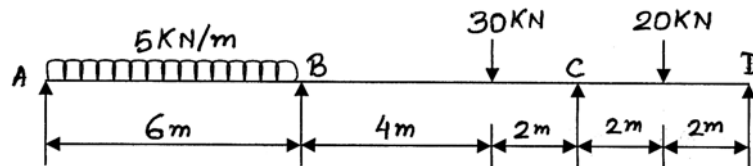


**GROUP – C**

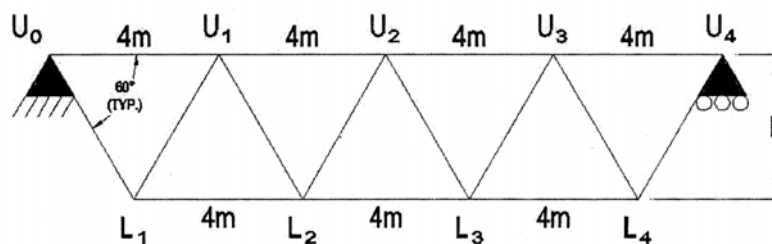
**( Long Answer Type Que tions )**

Answer any *three* of the following.  $3 \times 15 = 45$

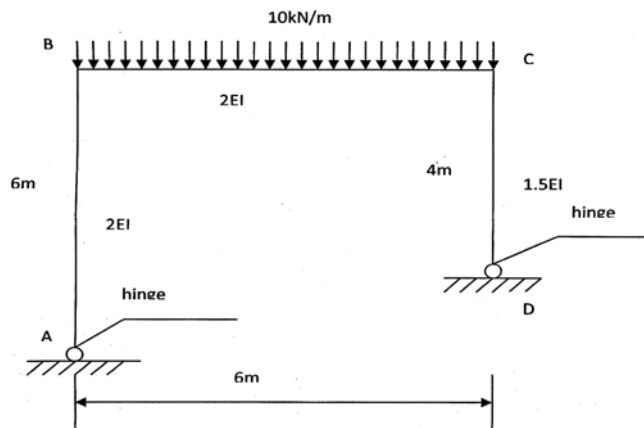
7. Analyses the continuous beam as shown below. Draw the S.F and B.M diagram. App y “Three moment theorem”. EI = constant.



8. Draw the Influence Line Diagram (I.L.D) for members  $U_1U_2$  and  $U_1L_2$  of the truss as shown below.



9. A symmetrical two hinged circular arch has a span of 16 m and central rise of 4 m, carries a vertical load of 16 kN at 4m from the left support. Find – (a) support reactions (b) bending moment at 6m from the left support.
10. Analyse the portal frame as shown below by “Moment distribution method” and draw the bending moment diagram.



11. Analyse the following 3 bay 2-storied frame as shown below by “Cantilever Method”. Draw the bending moment diagram. Area of cross section of all members is constant.

