Reg. No. : .....

Name : .....

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**E – 4171**

# Fourth Semester B.Tech. Degree Examination, August 2018
## (2013 Scheme)
## 13.403 : STRUCTURAL ANALYSIS – I (C)

Time : 3 Hours

Max. Marks : 100

## PART – A

Answer **all** questions : **(5×4=20 Marks)**

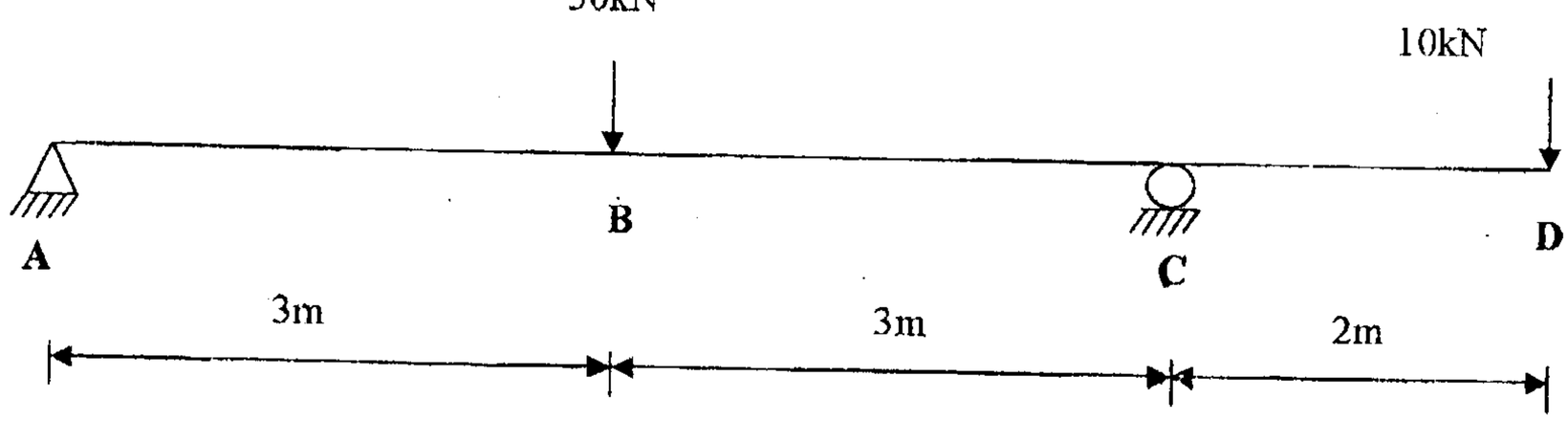
1. Explain Moment Area method to find out deflection at the given point in a simply supported beam.
2. Explain Castigliano's first theorem.
3. Briefly explain Betti's theorem.
4. Briefly explain different types of arches with the help of sketches.
5. Two wheel loads of 16 kN and 8 kN at a fixed distance apart of 2 m cross a beam of 10 m span. Draw ILD for bending moment and shear force for a point 4 m from left and find the maximum Bending Moment and Shear Force at that point.

## PART – B

Answer **one full** question from **each** Module : **(4×20=80 Marks)**

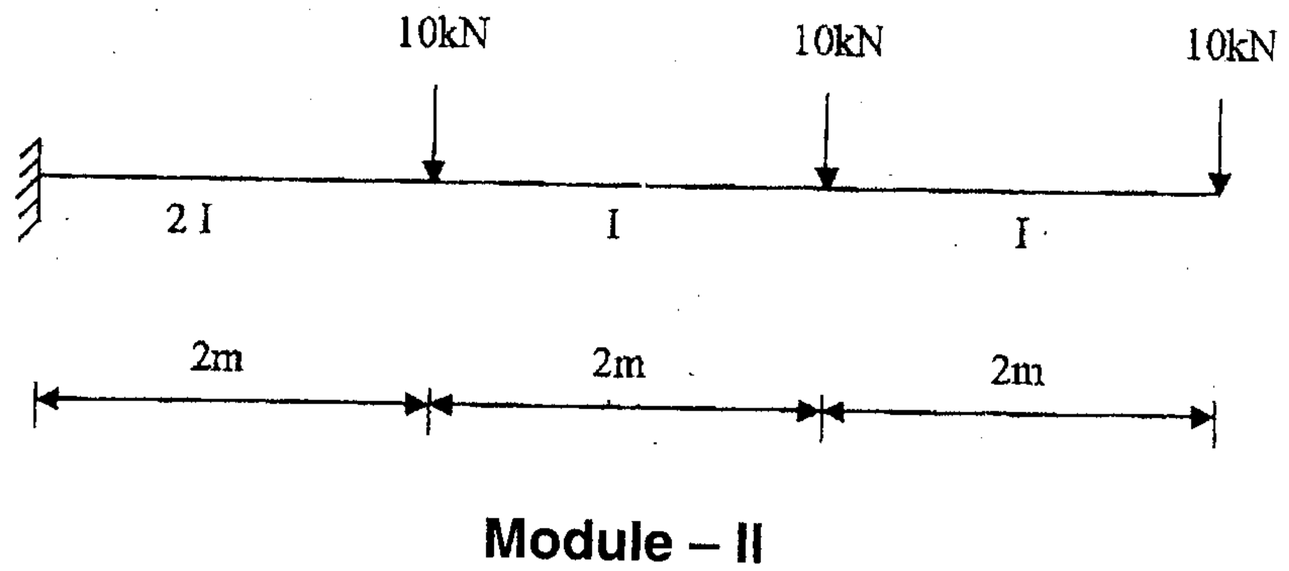
### Module – I

1. Determine slope at A and D and deflection at C and D for the beam shown below $E = 2 \times 10^5$ N/mm$^2$, $I = 2 \times 10^7$ mm$^4$ (Use Conjugate Beam method).



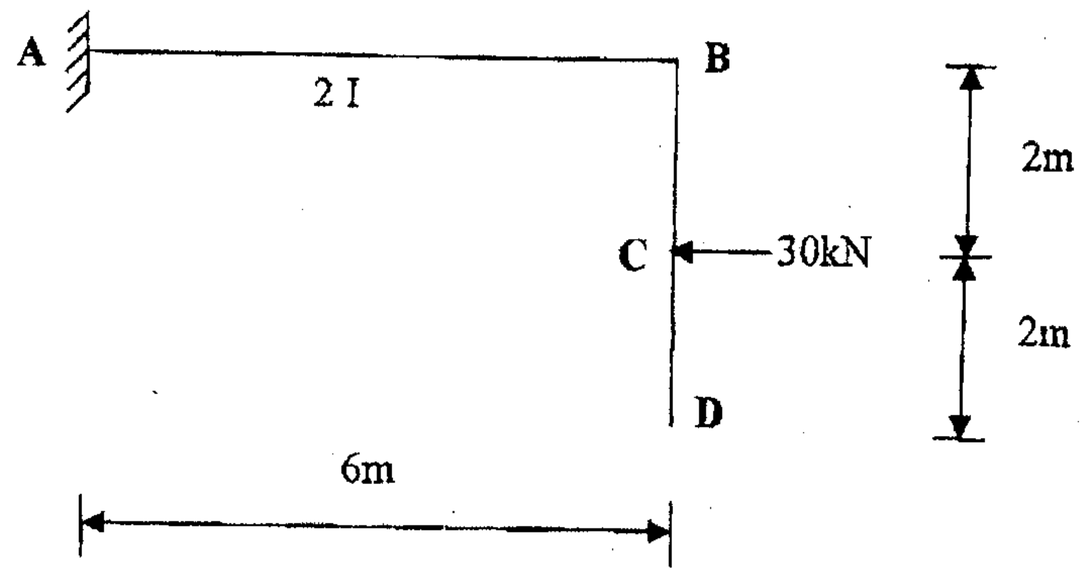

OR

2. Determine the maximum slope and deflection for the Cantilever beam for the following figure, $E = 2 \times 10^5$ N/mm$^2$, $I = 2 \times 10^8$ mm$^4$.



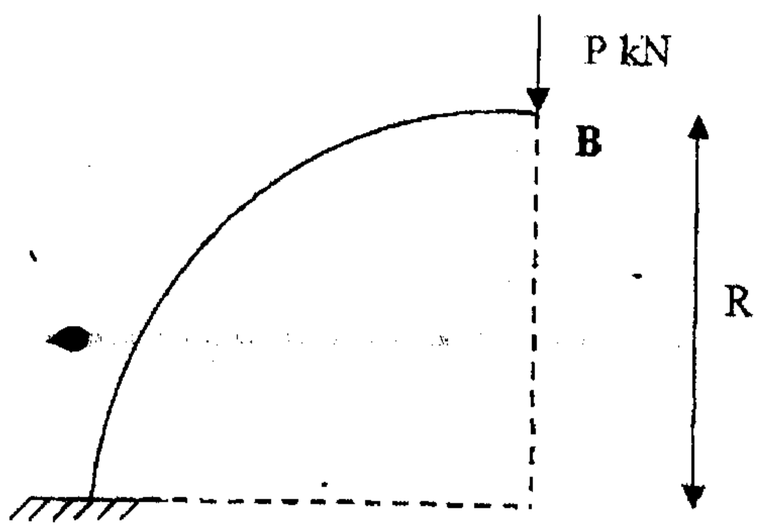

## Module – II

3. Obtain the horizontal deflection at D for the frame shown below. $E = 2 \times 10^5$ N/mm$^2$, $I = 2 \times 10^8$ mm$^4$. (Use virtual work method)




OR

4. Using Castigliano's theorem, find the vertical and horizontal displacement under the point load of a quadrant of the circular ring of radius R shown below :



## Module – III

5. A Slender column 1800 mm long and of rectangular section, 30 mm × 12 mm transmits a longitudinal load 'P' acting at the centre of each end. The column was slightly bent about its minor principal axis before bending. If 'P' is increased from 500 N to 1500 N at the middle of length increases by 4 mm. Determine the amount of deflection before loading. Find also total deflection and maximum stress when P = 2000 N ? E = $2.15 \times 10^5$ N/mm$^2$.

OR

6. A symmetrical three hinged arch which is circular has a span of 16 m and rise of 4 m. It carries a vertical load of 16 kN at 4 m from the left end. Find :
   i) Magnitude of thrust at springings
   ii) Reaction at the support
   iii) Bending Moment at 6 m from left hand hinge
   iv) Maximum positive and negative moment.

## Module – IV

7. The following system of wheel loads cross a span of 25 m.

| Wheel Load | 16 kN | 16 kN | 20 kN | 20 kN | 20 kN |
|---|---|---|---|---|---|
| Distance between centres | 3 m | 3 m | 4 m | 4 m | |

Find the maximum value of bending moment and Shear force in the span by using influence line diagram.

OR

8. Two point loads 100 kN and 50 kN spaced 3 m apart cross a girder of 10 m span the smaller load leading from left to right. Construct the maximum Shear Force and bending Moment diagram stating the position and amount of absolute maximum Bending moment.