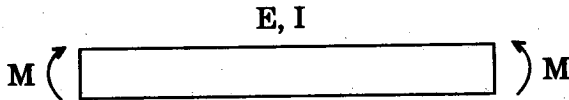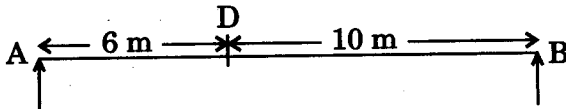# B.Tech. CIVIL ENGINEERING (BTCLEVI)
Term-End Examination
December, 2015

BICE-011 : STRUCTURAL ANALYSIS – II

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Use of scientific calculator is permitted. Assume any missing data suitably. All questions carry equal marks.*

1. Explain the Castigliano's First and Second theorem in detail with suitable examples. **10**

2. Figure 1 shows a beam subjected to a uniform moment 'M'. The moment of inertia of the entire section of the beam is I. Derive strain energy due to bending. **10**

E, I

M ([   ]) M

Figure 1

3. A uniformly distributed load of 60 kN/m of length 5 m moves on a girder of span 16 m. Find the maximum positive and negative shear force at a section 6 m from the left end. Also draw the influence line diagram. (Figure 2) **10**

D
A ←— 6 m —→*←—— 10 m ——→ B

Figure 2

4. **(a)** Two wheel loads 200 kN and 80 kN spaced 2 m apart move on the span of a girder of span 16 m. Find the maximum bending moment that can occur at a section 6 m from the left end. Any wheel can lead the other. (Figure 3)   *5*
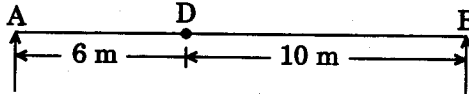

Figure 3

(b) A live load of 50 kN/m, 8 m long moves on a simply supported girder of span 10 m. Find the maximum bending moment which can occur at a section, 4 m from the left end. (Figure 4)   *5*
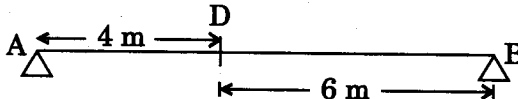

Figure 4

5. A three-hinged arch has a span of 30 m and rise of 10 m. The arch carries a uniformly distributed load of 60 kN/m on the left half of its span. It also carries two concentrated loads of 160 kN and 100 kN at 5 m and 10 m from the right end. Determine the horizontal thrust at each support. (Figure 5)   *10*
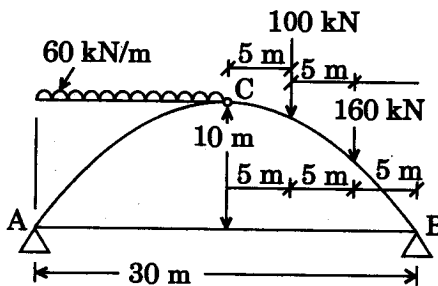

Figure 5

6. A two-hinged semicircular arch of radius 20 m carries a load system shown in Figure 6. Determine the horizontal thrust at each support. Assume uniform flexural rigidity.   *10*
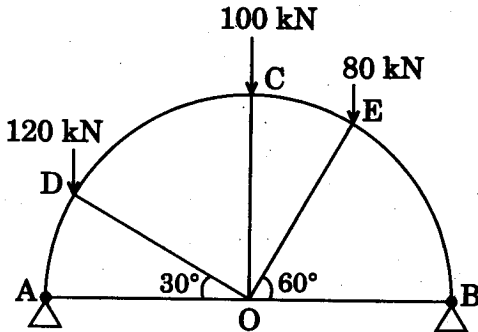

Figure 6

7. Explain the following : $4×2\frac{1}{2}=10$

   (a) Statistical Indeterminacy

   (b) Kinemetic Indeterminacy

   (c) Eddy's Theorem

   (d) Rib Shortening in arches

8. Find the fixed end moments and plot S.F. and B.M. diagrams for the beam loaded as shown in Figure 7.   *10*
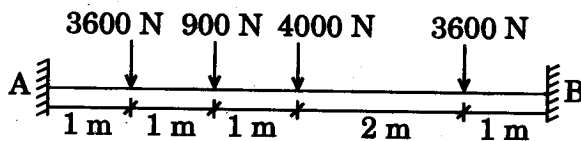

Figure 7

9. Analyse the continuous beam shown in Figure 8 by moment distribution. *10*
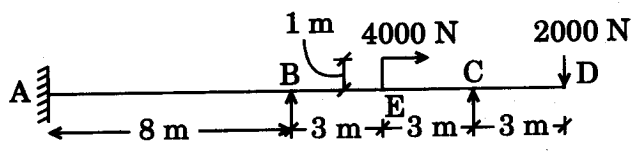

Figure 8

10. Determine the support moments and reactions for the continuous beam as shown in Figure 9. Use slope deflection method. Also draw the B.M. diagram. *10*
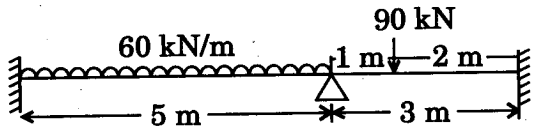

Figure 9