

BACHELOR OF ARCHITECTURE (BARCH)

Term-End Examination 00182

December, 2011

BAR-034 : THEORY OF STRUCTURES-IV

Time : 3 hours

Maximum Marks : 70

Note : Question no. 1 is *compulsory*. Attempt *any four* from the remaining questions. Use of *scientific* calculator, IS : 800 code and steel table is permitted.

1. Choose the most appropriate answer out of the following options : **2x7=14**

- (a) According to Eddy's theorem, the vertical intercept between the linear arch and the centre line of actual arch at any point represents to some scale.
- (i) bending moment
- (ii) shear force
- (iii) normal thrust
- (iv) deflection

- (b) Three hinged arch is :
- (i) statically indeterminate by one degree.
 - (ii) statically indeterminate by two degrees.
 - (iii) statically determinate
 - (iv) unstable structure
- (c) Degree of kinematic indeterminacy of the beam shown below is :

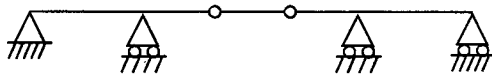
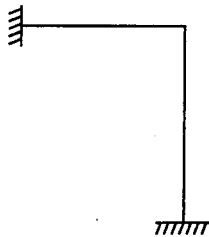


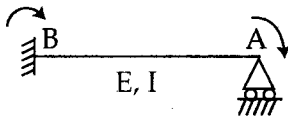
Figure - 1

- (i) 4
 - (ii) 10
 - (iii) 8
 - (iv) 6
- (d) The degree of static indeterminacy of the structure shown below is :



- (i) 1
- (ii) 2
- (iii) 3
- (iv) 4

- (e) When a unit rotation is given at end A of the beam shown below, the moment produced at end B will be :



- (i) zero (ii) $\frac{2EI}{L}$
- (iii) $\frac{4EI}{L}$ (iv) $\frac{6EI}{L}$
- (f) Bolts are most suitable to carry :
- (i) axial tension
- (ii) shear
- (iii) bending
- (iv) shear and bending both
- (g) The effective length of a bathened column is increased by.
- (i) 5% (ii) 10%
- (iii) 15% (iv) 20%

2. The continuous beam shown in figure 1 has rigidly fixed ends at C and D, is pinned at E and has rigid joints at A and B. The members are of uniform section and material throughout. Analyse the frame and draw the bending moment diagram showing all the important values. 14

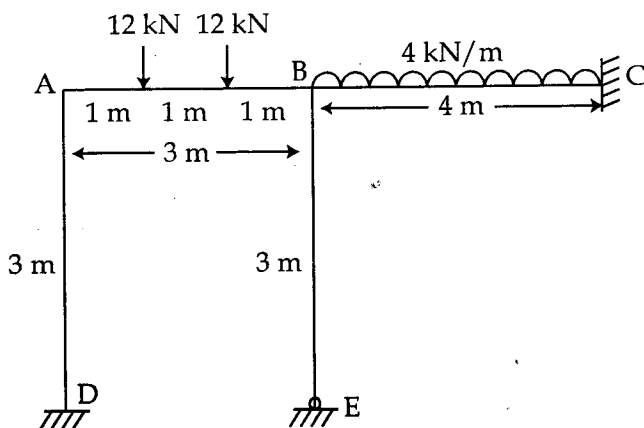


Figure - 1

3. Design a built-up column composed of two channel sections placed back to back, carrying an axial load of 1345 kN. The column, having a length of 7.5 m, is effectively held in position at both ends, but restrained against rotation at one end only. Find the spacing, thickness and depth of the batten plates. Take $f_y = 250 \text{ N/mm}^2$ 14

4. A simply supported beam has effective span of 14 7m and carries a uniformly distributed load of 50 kN/m. Taking $f_y = 250 \text{ N/mm}^2$ and $E = 2 \times 10^5 \text{ N/mm}^2$, design the beam if it is laterally supported.
5. Two 16 mm plates are to be joined using bolts. Design the connection considering the joint as. 7+7=14
- doubly bolted lap joint
 - butt joint with double cover plates
6. Design a welded connection to join two plates of 14 $250 \times 10 \text{ mm}$ with $f_y = 250 \text{ N/mm}^2$ to mobilize the full plate tensile strength using :
- a lap joint
 - a butt joint
- Use fillet welds only.
7. Write short notes on any four of the following : 3½x4=14
- Advantages and disadvantages of indeterminate structures.
 - Efficiency of an arch
 - Structural importance of portal frames
 - Advantages and disadvantages of welded connections.
 - Steel as a structural material.