

BACHELOR OF ARCHITECTURE (BARCH)

Term-End Examination

01534

June, 2011

BAR-034 : THEORY OF STRUCTURES-IV

Time : 3 hours

Maximum Marks : 70

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

1. Choose the most appropriate answer from the options given. $2 \times 7 = 14$

(a) Degree of static indeterminacy of a rigid jointed plane frame having 15 members, 3 reaction components and 14 joints is :

(i) 2 (ii) 3

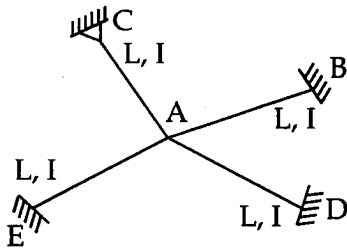
(iii) 6 (iv) 8

(b) In moment distribution method the sum of distribution factors of all the members meeting at any joint is always :

(i) zero (ii) less than 1

(iii) 1 (iv) greater than 1

- (c) For the structure shown below, the ratio of relative stiffness for AB and AC is :



- (i) $\frac{4}{3}$
- (ii) 2
- (iii) $\frac{3}{4}$
- (iv) $\frac{1}{2}$
- (d) In the cross-section of a weld, throat is of the :
- (i) maximum dimension
- (ii) average dimension
- (iii) minimum dimension
- (iv) none of the above

- (e) Which of the following types of rivetted joint is free from bending stresses ?
- lap joint
 - butt joint with single cover plate
 - butt joint with double cover plate
 - butt joint with no cover plate
- (f) The heaviest I-section for same depth is :
- ISMB
 - ISLB
 - ISWB
 - ISHB
- (g) A three hinged arch is carrying uniformly distributed load over the entire span. The arch is free from shear force and bending moment if its shape is :
- circular
 - parabolic
 - elliptical
 - triangular

2. A continuous beam ABC is supported on an elastic column BD, and is loaded as shown in figure 1. Treating joint B as rigid, analyse the frame and plot the bending moment diagram and sketch the deflected shape of the structure. 14

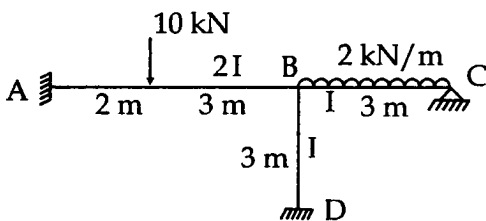


Figure - 1

3. Design a built-up column using single lacing to carry an axial load of 1200 kN. The column is to be designed using channel sections placed back to back. Effective length of the column is 5 m. The connections are all welded ($\sigma_y = 250$ MPa). 14
4. Design a simply supported I-section beam of 8 m span carrying a uniformly distributed load of 45 kN/m. The compression flange may be assumed laterally supported throughout its length. Take $f_y = 250$ MPa. 14
5. Determine the strength (per mm length of the weld) of a butt-welded joint in tension, where two 16 mm thick plates are joined by : 14
- (a) a double - V butt weld
 - (b) a single - V butt weld
6. (a) What do you understand by effective length of a column ? Explain how end conditions affect it. 7
- (b) Explain the procedure of calculating the "distribution factor" used in moment distribution method. 7

7. Write short notes on **any four** of the following :

$3\frac{1}{2} \times 4 = 14$

- (a) Advantages and disadvantages of bolted connections
 - (b) Structural behaviour of a three-hinged arch
 - (c) Structural systems in steel
 - (d) Types of welded connections
 - (e) Determinate and indeterminate frames
-