

**Diploma in Civil Engineering DCLE(G)**  
**Advanced Level Certificate Course in Civil Engineering**  
**DCLEVI/ACCLEVI**

**Term-End Examination**

**December, 2013**

**BCE-032 : THEORY OF STRUCTURES-I**

*Time : 2 hours*

*Maximum Marks : 70*

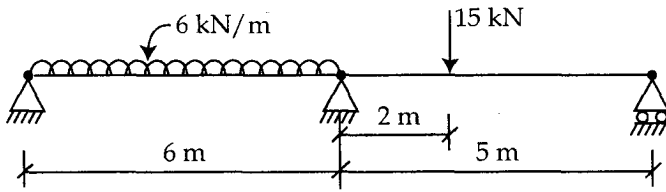
*Note : Question number 1 is compulsory. Attempt any four questions from the remaining. In all solve five questions. Assume suitable data wherever necessary and mention it. Use of calculator and steel tables is permitted.*

1. Choose the most appropriate answer from the following alternatives in each case. **7x2=14**
- (a) The nominal diameter of a rivet is 25mm.  
The gross diameter will be :
- (i) 25mm.                      (ii) 23mm.  
(iii) 27mm.                    (iv) 26.5mm
- (b) The efficiency of a riveted joint is equal to the ratio of :
- (i) Least strength of joint to the strength of solid plate  
(ii) Greatest strength of the joint to the strength of solid plate  
(iii) Least strength of the riveted plate to the greatest strength of the joint  
(iv) All the above
- (c) The cross section of standard fillet weld is a triangle with base angles of :
- (i) 30° and 60°                (ii) 40° and 50°  
(iii) 35° and 55°              (iv) 45° and 45°

- (d) If 't' is the thickness of the plates to be welded, the maximum size of the fillet weld is :
- (i) t                      (ii) t - 1.5mm  
 (iii) t - 2mm      (iv) t - 1mm
- (e) The slenderness ratio of compression member carrying compressive loads resulting from dead and superimposed loads only shall not exceed :
- (i) 400                      (ii) 350  
 (iii) 250                      (iv) 180
- (f) If one end of a prismatic beam AB of length 'l' which is fixed at A and B is given a transverse displacement  $\Delta$  without any rotation at the fixed ends, then the transverse reactions at A and B due to this displacement  $\Delta$  is :
- (i)  $6 EI\Delta/l^2$                       (ii)  $6 EI\Delta/l^3$   
 (iii)  $12 EI\Delta/l^2$                       (iv)  $12 EI\Delta/l^3$
- (g) The ordinate of the influence line diagram for bending moment always have the dimensions of :
- (i) Force                      (ii) Length  
 (iii) Force  $\times$  Length      (iv)  $\frac{\text{Force}}{\text{Length}}$

2. A fixed beam AB of span 10m carries a uniformly distributed load of 10kN/m upto 3m from the left hand support A and a point load of 10kN at 3m from the right hand support B. Analyse the beam and draw the bending moment and shear force diagrams. 14

3. Analyse the continuous beam shown below and draw the bending moment and shear force diagrams. The beam has constant  $EI$  throughout. 14



4. A simply supported beam of span ' $l$ ' is loaded with a uniformly distributed load of  $W/m$ .  $EI$  for the beam is constant throughout. Using Moment Area Theorems calculate the slopes at the supports and the deflection at the centre. 14

5. An ISA  $100 \times 100 \times 6$  ( $f_y = 250\text{MPa}$ ) is used as a strut in a roof truss. The length of the strut between intersection is 3.0m. Calculate the strength of the strut if :
- (a) It is connected by one rivet at each end. 5
  - (b) It is connected by two rivets at each end. 5
  - (c) It is welded at each end. 4

6. (a) Explain the various types of rivets used in steel structures with the help of sketches. 6
- (b) A 6mm thick angle section is joined to a 10mm thick gusset plate by means 16mm diameter hand driven field rivets. The angle is subjected to a tensile force of 55kN. Find the number of rivets required for the joint. The permissible stresses in hand driven field rivets are  $72\text{N/mm}^2$  and  $225\text{N/mm}^2$  in shearing and bearing respectively. Draw the neat sketch of the joint. 8

7. A masonry dam 8m high is 1.5m wide at the top and 5m wide at the base. It retains water upto a depth of 7.5m. The water face of the dam is vertical. The weight of masonry is  $22.4\text{kN/m}^3$ . Find the maximum and minimum stresses at the base and also calculate the factor of safety against sliding if the coefficient of friction between the soil and the dam base is 0.6. 14
8. Write short notes on *any four* of the following :  $4 \times 3\frac{1}{2} = 14$
- (a) Assumptions for the design of riveted joints.
  - (b) Stiffness of a beam and distribution factor in moment distribution method.
  - (c) Various types of roof trusses.
  - (d) Web buckling of I - Section.
  - (e) Minimum depth of foundation.
  - (f) Loads acting on roof trusses.
  - (g) Carry over moments in moment distribution.
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