No. of Printed Pages : **4 + Drawing Sheet**

BCE-041

Diploma in Civil Engineering (DCLE(G))

DCLEVI

Term-End Examination

December, 2013

BCE-041 : THEORY OF STRUCTURES - II

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt question* ***No. 1*** *which is* ***compulsory*** *and any other* ***four*** *questions. Solve* ***five*** *questions in all.All questions* ***carry equal*** *marks. Assume suitable data wherever necessary and mention it clearly. Use of calculator is* ***permitted.***

1. Choose the most appropriate answer from the given alternatives in questions (a) to (g) below : **7x2=14**

(a) In a singly reinforced beam if permissible compressive stress in concrete reaches earlier than the permissible tensile stress in steel, the beam section is called :
(i) Under reinforced section
(ii) Over reinforced section
(iii) Balanced section
(iv) Critical section

(b) In working stress method of design, the permissible bond stress in case of deformed bars is more than that in plain bars by :
(i) 10% (ii) 20%
(iii) 40% (iv) 60%

(c) According to IS : 456-2000, the minimum reinforcement in a column is :
(i) 6% (ii) 8%
(iii) 0.6% (iv) 0.8%

(d) Due to shrinkage stresses, a simply supported beam having reinforcement only at bottom tends to :
   (i) Deflect upwards
   (ii) Deflect downwards
   (iii) Deflect downward or upward
   (iv) None of the above.

(e) The percentage of tensile reinforcement in case of a beam when high strength deformed bars are used shall not be less than :
   (i) 0.15 (ii) 0.20
   (iii) 0.30 (iv) 0.12

(f) In limit state method of design for the flexural members the area of the stress block per unit width of the beam is :
   (i) 0.45 *f*ck x_u
   (ii) 0.42 *f*ek x_u
   (iii) 0.36 *f*ck x_u
   (iv) None of these

(g) In limit state method for the design of R.C.C flexural members, the stress-strain relationship for concrete is assumed to be a parabolic curve upto a strain of 0.002 in concrete. There after it is constant upto collapse. The height of this point of the stress block from the neutral axis is equal to :
   (i) 3/7 of the depth of neutral axis
   (ii) 4/7 of the depth of neutral axis
   (iii) 5/7 of the depth of neutral axis
   (iv) None of these.

2. A R.C.C rectangular beam of width 250mm and overall depth of 500mm is reinforced with 4 bars of 20mm diameter . Check whether the beam section is under reinforced , over reinforced or balanced and calculate the factored moment the beam can carry. Given that : **14**

Nominal cover = 20mm
Diameter of shear reinforcement = 8mm
Characteristic strength of concrete in compression fck = 20N/mm^2
Characteristic yield strength of steel in tension fy = 415N/mm^2

3. (a) Mention the basic assumptions made in the theory for the design of reinforced concrete flexural members by working stress method. Also draw the strain and stress diagrams for a singly reinforced rectangular section to be designed by working stress method and calculate the depth of neutral axis for a balanced section. 7

(b) Determine the depth of neutral axis for a balanced section of width 250mm and effective depth of 500mm. Given that $\sigma_{cbc} = 8.5N/mm^2, \sigma_{st} = 230N/mm^2$ and modular ratio = 11 7

4. Design a simply supported beam of 5m clear span loaded with a uniformly distributed load of 20kN/m using limit-state method. Adopt support width of 250mm, fck = 20N/mm^2, fy=415N/mm^2 for tensile reinforcement and 250N/mm^2 for shear reinforcement. 14

5. Design the longitudinal as well as transverse reinforcement for a circular column of diameter 300mm for a factored load of 1200kN. The unsupported length of the column is 3.25m and the design parameters are fck=20N/mm^2 and fy=415N/mm^2 14

6. Determine the factored moment that a T-section can carry having a flange width of 2000mm, web width of 350mm, depth of slab = 110mm and an overall depth of 350mm. The beam is reinforced with 4 bars of 20mm ϕ with an effective cover of 50mm. Assume fck = 20MPa and fy = 415MPa. **14**

7. Write short notes on ***any four*** of the following : **4x3½=14**
   (a) Limit state of collapse
   (b) Effective length of columns
   (c) Development length for reinforcement
   (d) Fire resistance of concrete
   (e) Earth pressure
   (f) Shear reinforcement
   (g) Need of working stress method for the design of water tanks