No. of Printed Pages : **5 + Drawing Sheet** | **BCE-041**

Diploma in Civil Engineering (DCLE(G))
DCLEVI

Term-End Examination 00952

June, 2013

BCE-041 : THEORY OF STRUCTURES - II

Time : 2 hours *Maximum Marks : 70*

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

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

(a) The relation between modulus of rupture (fcr) and characteristic strength of concrete (fck) is given below :

(i) $fcr = 0.35 \sqrt{fck}$

(ii) $fcr = 0.5 \sqrt{fck}$

(iii) $fcr = 0.7 \sqrt{fck}$

(iv) $fcr = 1.2 \sqrt{fck}$

(b) The strength of concrete after one year as compared to 28 days strength is about :

(i) 10 to 15 % more

(ii) 15 to 20 % more

(iii) 20 to 25 % more

(iv) 25 to 50 % more

(c) A continuous beam is deemed to be a deep beam when the ratio of effective span to overall depth (I/D) is less than :

(i) 1.5 (ii) 2.0

(iii) 2.5 (iv) 3.0

(d) In counterfort type retaining walls :

(A) the vertical slab is designed as a continuous slab.

(B) the heel slab is designed as a continuous slab.

(C) The vertical slab is designed as a cantilever.

(D) the heel slab is designed as a cantilever.

The correct answers are :

(i) (A) and(B)

(ii) (A) and (D)

(iii) (B) and (C)

(iv) (C) and (D)

(e) According to Indian standard recommendations, the maximum depth of stress block for balanced section of a beam of effective depth d is :

(i) 0.43d (ii) 0.55d

(iii) 0.68d (iv) 0.85d

(f) Minimum pitch of transverse reinforcement in a column is :

(i) the least lateral dimension of the member

(ii) sixteen times the smallest diameter of longitudinal reinforcement bar to be tied.

(iii) forty-eight times the diameter of transverse reinforcement.

(iv) lesser of the above three values.

(g) The percentage of reinforcement in case of slab, when high strength deformed bars are used is not less than :

(i) 0.15 (ii) 0.12

(iii) 0.30 (iv) 1.00

2. Determine moment of resistance of a doubly reinforced section of following data : b = 300mm, d = 655mm, d' = 45mm, fy = 415MPa and fck = 20MPa. Consider Area of steel in compression to be 982mm^2 and Area of steel in tension as 1964 mm^2. **14**

3. Design a simply supported slab to cover a room with internal dimensions 4×5 mtr, and 230 mm thick brick walls all round. Assume live load of 3 kN/m^2 and a finish load of 1 kN/m^2. Use M20 concrete and Fe415 steel. Assume that the slab corners are free to lift up. **14**

4. Design a staircase (dog-legged) for an office building. Assume a floor to floor height of 3.0m, a flight width of 1.2m and a landing width of 1.25m. Assume the stairs to be supported on 230mm thick masonry wall at the edge of landing, parallel to the risers. Use M20 concrete and Fe 415 steel. Assume live load of 5.0 kN/m^2 and mild exposure conditions. **14**

5. Design a plain concrete footing for a column, 300mm $\times$ 300mm, carrying an axial load of 330kN (under service loads, due to dead and live loads). Assume an allowable soil bearing pressure of 360kN/m^2 at a depth of 1.0m below ground. Assume M20 concrete and Fe 415 steel. **14**

6. Design the reinforcement in a spiral column of 400mm diameter subjected to a factored load of 1500 kN. The column has an unsupported length of 3.4m and is braced against side way. Use M25 concrete and Fe 415 steel. **14**

7. A simply supported one-way slab has an effective span of 3.5m. It is 150 mm thick and is reinforced with 10 mm φ bars@200mm spacing located at an effective depth of 125mm. Assuming M20 concrete and Fe 415 steel, determine the superimposed service load (in kN/m^2) that the slab can safely carry according to working stress method. **14**

8. Write short notes on **any four** of the following : **4x3½=14**

   (a) Creep of concrete

   (b) Basic Assumption for design of RC beam section

   (c) Shrinkage and temperature effects in concrete

   (d) Deflection control

   (e) Allowable soil pressure

   (f) Fire resistance of concrete