DIPLOMA IN CIVIL ENGINEERING
DCLE(G)/DCLEVI

00562

Term-End Examination
June, 2019

BCE-041 : THEORY OF STRUCTURES - II

Time : 2 hours *Maximum Marks : 70*

Note : *(i) Question no. 1 is **compulsory**. Attempt any other **four** questions.*

*(ii) **All** questions carry **equal** marks.*

(iii) Use of scientific calculator is permitted.

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

(a) Partial safety factor for loads for limit state of collapse is equal to :

(i) 1.5 (ii) 2.0

(iii) 1.0 (iv) 1.15

(b) The final vertical deflection due to all loads including creep, shrinkage and temperature of a member shall not be :

(i) $> \frac{lef}{350}$ (ii) $> \frac{lef}{250}$

(iii) $> \frac{lef}{150}$ (iv) 20 mm

(c) In the design of slab, the maximum diameter of reinforcing bars shall not be :

(i) $< \frac{1}{4}$th of the thickness of the slab

(ii) $> \frac{1}{8}$th of the thickness of the slab

(iii) < 50 mm

(iv) > 8 mm

(d) The cross-sectional area of longitudinal bars in a column shall not be more than :

(i) 0.8% of the gross sectional area

(ii) 1.2% of the gross sectional area

(iii) 6% of the gross sectional area

(iv) 8% of the gross sectional area

(e) At the neutral axis of a beam, the strain is :

(i) maximum (ii) zero

(iii) not known (iv) depends on stress

(f) The maximum strain in concrete in flexure is :

(i) 0.20% (ii) 0.35%

(iii) 0.4% (iv) 0.5%

(g) Minimum dia of bars as longitudinal reinforcement in a column shall be :

(i) 12 mm (ii) 10 mm

(iii) 20 mm (iv) 8 mm

2. Determine the shear reinforcement in form of vertical stirrups of ϕ 6 of a rectangular section of $b \times d = 250$ mm $\times$ 450 mm reinforced with 4 ϕ 20 to resist 100 kN shear force. Use M_{25} concrete, Fe 415 for main reinforcement and Fe 250 for transverse reinforcement. **14**

$\varepsilon = 0.67$ N/mm^2

3. A reinforced concrete beam of rectangular section of size 250×550 mm overall is to be designed for a factored moment of 225 kNm. Compute the reinforcements considering effective cover of 50 mm. The concrete mix to be used is M_{20} and the grade of steel is Fe 415. **14**

Take $f_{sc} = 351.93$ N/mm^2 for $d'/d = 0.1$

4. Design longitudinal reinforcement for a circular column of dia 350 mm with helical reinforcement as traverse reinforcement of ϕ 8 @ 45 c/e for a factored load of 1800 kN and effective length 2.75 m for the following design parameters. **14**

$f_y = 415$ and $f_{ck} = 20$ N/mm^2.

5. Design a strip footing for a concrete wall of 300 mm thickness carrying a load 700 kN/m. Design parameters are as follows : **14**

$p_{BC} = 180$ kN/m^2 $\quad$ $f_{ck} = 25$ N/mm^2

$f'_y = 415$ N/mm^2.

6. Distinguish between one way slab and two way slab. Give steps to design two way slab with details of reinforcement. Also discuss support conditions. **14**

7. Design a staircase having cantilever steps for a residential house where floor to floor height is 3.6 m and staircase size is $2.0 \text{ m} \times 4.05$ m. Use M_{20} concrete and Fe 415 steel. **14**

8. (a) Discuss the steps to design cylindrical tank with flexible base resting on the ground. Draw a typical diagram of reinforcement. **9**

   (b) Discuss Limit State of Serviceability. **5**
