CBCS Scheme

USN | | | | | | | | | | 15CV/CT51

# Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
## Design of RC Structural Elements

Time: 3 hrs. Max. Marks: 80

***Note: 1. Answer any FIVE full questions, choosing one full question from each module.***
***2. Use of code IS456:2000 and SP-16 is permitted.***



### Module-1

1 a. Explain: (i) Characteristic load; (ii) Characteristic strength; (iii) Partial safety factor. **(06 Marks)**

b. What is stress block? Derive from the fundamentals the expressions for the area of stress block $0.36\ f_{ck} b x_u$ and depth of centre of compressive force from the extreme fibre in compression $0.42\ x_u$. **(10 Marks)**

**OR**

2 a. Explain: (i) Developmental length of bars; (ii) Short term deflection; (iii) Long term deflection **(06 Marks)**

b. A rectangular simply supported beam of span 5 m is 300 × 650 mm in cross section and is reinforced with 3 bars of 20 mm on tension side at an effective cover of 50 mm. Determine the short deflection due to an imposed working load of 20 kN/m excluding self weight. Assume grade of concrete M20 and steel as Fe415. **(10 Marks)**

### Module-2

3 a. Differentiate between under reinforced, over reinforced and balanced section. **(06 Marks)**

b. A RCC beam of section 300 mm × 500 mm is reinforced with 4 bars of 16 mm diameter with an effective cover of 50 mm. The beam is simply supported over a span of 5 m. Find the maximum permissible udl on the beam. Use M20 grade concrete and Fe 500 steel. **(10 Marks)**

**OR**

4 a. A RCC beam 250 mm wide and 450 mm deep is reinforced with 3 numbers of 20 mm dia bars of grade Fe415, on the tension side with an effective cover of 50 mm. If the shear reinforcement of 2 legged-8 mm dia stirrups at a spacing of 160 mm c/c is provided at a section, determine the design ultimate strength of the section. Assume M20 concrete. **(07 Marks)**

b. A T-beam RC floor system consists of 120 mm thick slab supported by beams at 3m c/c. The effective width and depth of web is 300*580 mm as shown in Fig.Q4(b). Main reinforcement consists of 8 bars of 20 mm dia. The grade of concrete and steel used are M20 and Fe415 respectively. Determine the moment of resistance of T-beam, if it is used as simply supported beam of span 3.6 m.

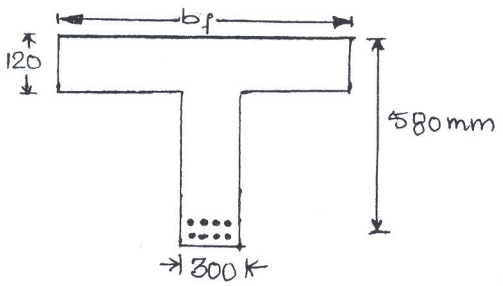


Fig.Q4(b) **(09 Marks)**

## Module-3

5 A rectangular beam is to be simply supported on supports of 230 mm width. The clear span of the beam is 6m. The beam is to have width of 300 mm. The super imposed load is 12 kN/m. Using M20 concrete and Fe415 steel. Design the beam. Apply check for deflection. **(16 Marks)**

**OR**

6 Design a rectangular beam of section 230 mm × 600 mm of effective span 6m. Effective cover of reinforcement should be kept as 50 mm. Imposed load on the beam is 40 kN/m. Use M20 concrete and Fe 415 steel. **(16 Marks)**

## Module-4

7 Design a continuous RC slab for a class room 7m wide and 14 m long. The roof is to be supported on RCC beams spaced at 3.5 m intervals. The width of beam should be kept 230 mm. The super imposed load is 3 kN/m$^2$ and furnishing load expected is 1 kN/m$^2$. Use M20 concrete and Fe415 steel. **(16 Marks)**

**OR**

8 Design a dog legged stairs for an office building in a room measuring 2.8m * 5.8 m clear. Vertical distance between the floor is 3.6m. Width of flight is to be 1.25 m. Allow a live load of 3 kN/m$^2$. Sketch the details of reinforcement. Use M20 concrete and Fe 415 steel. Assume the stairs are supported on 230 mm walls at the end of outer edges of landing slabs. **(16 Marks)**

## Module-5

9 A corner column 400 * 400 mm, is subjected to the factored loads $P_u$ = 1300 kN, $M_{ux}$ = 190 kN-m and $M_{uy}$ = 110 kN-m. Design the reinforcement in the column, assuming M25 concrete and Fe 415 steel and effective cover of 60 mm. Assume it as short column. **(16 Marks)**

**OR**

10 Design a square footing for a short axially loaded column of size 300 mm * 300 mm carrying 600 kN load. Use M20 concrete and Fe415 steel. SBC of soil is 180 kN/m$^2$. Sketch the details of reinforcement. **(16 Marks)**

* * * * *