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**Sixth Semester B.E. Degree Examination, June/July 2017**  
**Design and Drawing of RC Structures**

Time: 4 hrs.

Max. Marks:100

- Note:** 1. Answer any TWO full questions from Part-A, ONE from Part-B.  
 2. Use of IS 456 – 2000 and SP – 16 is permitted.

**PART – A**

- 1** A rectangular beam of cross section  $300 \times 450\text{mm}$  is supported on 5 columns which are equally spaced at a c/c distance of 3.3m. The columns are  $300 \times 300\text{mm}$  in section. The reinforcement in beam consists of 4 bars of 16mm dia (+ve reinforcement) at midspan and 4 bars of 16mm dia at all supports (–ve reinforcement). 2 bars of +ve reinforcement have been curtailed near each support. Anchor bars consists of 2 – 16mm dia. Stirrups are of 8mm dia. 2 legged vertical at 200 c/c. Draw longitudinal section and important cross sections. Grade of concrete M20 and steel Fe 415 grade. (20 Marks)
- 2** A dog legged staircase is to be detailed with the following particulars :
- |                                    |                                 |
|------------------------------------|---------------------------------|
| Size of stair case room            | = $2200 \times 4600\text{mm}$   |
| Width of flight                    | = 1050mm                        |
| Width of landing                   | = 1050 mm                       |
| Number of treads in each flight    | = 10                            |
| Thread                             | = 250mm and                     |
| Rise                               | = 150mm                         |
| Wall thickness                     | = 230mm all-round               |
| Waist slab thickness               | = 150mm                         |
| Main steel                         | = 120mm HYSD bars @ 100 c/c and |
| Distribution steel for each flight | 8mm = @ 200 c/c                 |
- First flight starts from ground floor level (GFL) and foundation is 750mm below GFL :  
 Second flight rests on wall. Draw to a suitable scale
- a. Plan
  - b. Section along first flight
  - c. Section along second flight. (20 Marks)
- 3** A square column of size  $300\text{mm} \times 300\text{mm}$  is provided with square isolated footing of size  $3\text{m} \times 3\text{m}$ .
- |                    |                                |
|--------------------|--------------------------------|
| Details of column  | : height of column 3m above GL |
| Longitudinal steel | : 8 no.'s of 12mm dia          |
| Transverse steel   | : 8mm dia lies at 200 c/c      |
- (One square tie connecting corner bars + another diamond tie connecting inner bars).
- |                                 |   |
|---------------------------------|---|
| Details of footing              | : depth of footing 1.2m below GL            |
| Depth of footing at column face | : 520mm                                     |
| Depth of footing at the edge    | : 230mm                                     |
| Reinforcement                   | : a mesh of 12mm dia HYSD bars at 150mm c/c |
- Provide suitable cover to steel reinforcement  
 Draw to a suitable scale :
- a. Plan
  - b. Sectional details
  - c. Prepare bar bending schedule. (20 Marks)

## PART – B

- 4 Design a cantilever retaining wall to retain earth embankment 4.75m height above ground level. The density of earth  $18\text{kN/m}^3$  and its angle of repose -  $30^\circ$ . The embankment is horizontal at the top. SBC of the soil may be taken as  $200\text{ kN/m}^2$  available at 1.25m below ground level the coefficient of friction between soil and concrete is 0.5. Adopt M20 grade of concrete and Fe 415 steel. (40 Marks)

Draw to a suitable scale :

- Cross sectional elevation
- Longitudinal section showing stem reinforcement and curtailment—for a length of 2m.
- Section showing heel and toe reinforcement. (20 Marks)

- 5 Design an RCC combined footing for two columns 3.2m apart.

Column A–  $300\text{mm} \times 300\text{mm} = P_A = 825\text{ kN}$

Column B–  $300\text{mm} \times 300\text{mm} = P_B = 930\text{ kN}$

Safe bearing capacity of soil may be taken as  $175\text{ kN/m}^2$ . The boundary line is at a distance of 0.8m from the centre line of column A. Use M20 grade concrete and Fe 415 grade steel. (40 Marks)

Draw to a suitable scale :

- Sectional elevation
- Plan of bottom reinforcement
- Cross-sections at salient points. (20 Marks)

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