

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)
FOURTH YEAR, 2ND SEMESTER 2019
DESIGN OF STRUCTURES-III

Time : 3 hours

Full Marks : 100

PART-I (50marks)

(use separate answer script for each part)

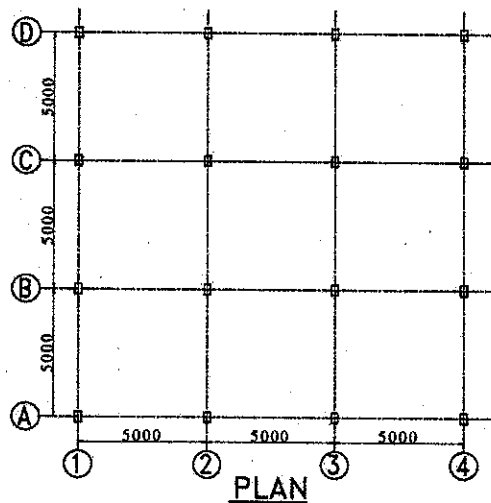
The figures in the margin indicate full marks

Assume reasonable value of any data if required.

IS code No.1893(Pt. 1), 875 (Pt. 3), 456 & SP 16 and IRC 6 & 21 are allowed in examination hall

Answer any two question

1. A four storied Institutional building of 15m x 15m as shown in fig.



Floor to floor height = 3.5m, Plinth height = 0.6m, Column size = 400mm x400mm

Outer wall = 250mm thick brick wall, Consider 125mm brick wall over all internal beams

Slab weight including finishing = 5.2 KN/sqm for typical floor, 6.1 KN/sqm for Roof,

Water tank at roof level = 200KN

Live load : 4 KN/sqm for typical floor, 1.5 KN/sqm for Roof.

Consider seismic zone II and soil type – Medium.

Calculate design seismic base shear and design lateral forces to different floor level.

2. Design a suitable pile cap for a RCC column of size 400mm x 400mm with total vertical load – 950 KN, moment in both X and Y direction = 55 KNM
Pile dia – 450 mm, Vertical capacity – 400KN, Horizontal capacity – 60KN
Uplift capacity - 100 KN
Apply 'Limit State Method' as per IS 456. Grade of concrete M25 and
Grade of steel Fe 500
Draw the reinforcement arrangement of pile cap.

25

3. A RCC slab culvert for a state highway with following data:
Carriage way =7.5m wide (two lane), Kerb =600mm wide, clear span = 6.0m, wearing coat =
80mm, width of bearing = 400mm.
Loading –IRC Class A or AA whichever gives the worst effect.
Design the RCC deck slab. Grade of concrete M25 and Grade of steel Fe 415
Draw the detail of reinforcement of the deck slab.

25

EX/CE/5/T/406/2019

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PART-II (50marks)

(use separate answer script for each part)

The figures in the margin indicate full marks

Assume reasonable value of any data if required.
IS code No. 3370(Pt. 4), 456 and SP 16 are allowed in examination hall

Answer any two of the following questions

1. Design a rectangular combined footing to support two columns of size 450 mm X 450 mm (with six 20 mm dia bars) and 600 mm X 600 mm (with six 25 mm dia bars), carrying 1000 KN and 1400 KN (service live + dead loads), respectively. These columns are located 4.0 m apart and the column carrying 1000 KN is flush with the property line. Assume safe bearing capacity of soil is 200 KN/m². Assume M25 concrete and Fe 415 steel. 25
2. A cantilever-retaining wall is required to retain earth 3.8m high above the ground level. The backfill surface is level and the backfill soil has a unit weight of 16 KN/m³ and angle of internal friction is 30°. The exposure condition is moderate. The safe bearing capacity of soil is 160 KN/m² and the coefficient of friction between the soil and concrete is 0.5. Design the RC retaining wall assuming M20 concrete and Fe 415 steel. 25
3. Design a circular water tank with fixed base for capacity of 500000 litres. The depth of water is to be 5 m. Free board is 300 mm. Use M20 grade concrete and Fe 415 steel. Permissible direct tensile stress in concrete is 1.2 MPa. Permissible stress in steel in direct tension is 100 MPa. Sketch the details of reinforcements in tank walls. Adopt IS code tables for coefficients. 25