

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2454

Roll No.

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**B. Tech.**

(SEM. VI) THEORY EXAMINATION 2011-12

**DESIGN OF CONCRETE STRUCTURES—2**

Time : 3 Hours

Total Marks : 100

**Note :** Attempt *all* questions. All questions carry equal marks. IS-456 and IS-3370 is permitted. Assume any suitable data, if missing. Show the structural details of design problems.

1. Attempt any *two* parts of the following : (10×2=20)
  - (a) Design an interior panel of a flat slab for a line load of 4 kN/m<sup>2</sup>. The slab is provided with a floor finish of 1 kN/m<sup>2</sup>. The panels are 6 m × 6 m. Drop shall be provided. Use M-20 grade concrete and Fe-415 steel.
  - (b) A hall of 25 m × 39 m is to be constructed and a flat slab is to be provided. Plan the geometry of flat slab with rectangular panels. Use M-20 grade concrete and Fe-415 steel.
  - (c) An interior column 450 mm × 600 mm size with column head 1.5 m × 1.5 m and drop 3 m × 3 m × 0.325 m is supporting flat slab panel of 6 m × 8 m. The thickness of flat slab is 260 mm. It is subjected to line load of 4 kN/m<sup>2</sup> and surface finish 1 kN/m<sup>2</sup>. Use M-20 grade concrete and Fe-415 steel.

2. Attempt any *two* parts of the following : (10×2=20)

- (a) Design a circular beam supported on 6 symmetrically placed columns. The diameter of the beam is 10 m and the load is 40 kN/m. The coefficient for maximum positive, negative moments and torsion are as follows :

$$M \text{ (negative)} = 0.093 w R^2$$

$$M \text{ (positive)} = 0.047 w R^2$$

$$T = 0.010 w R^2$$

- (b) A square column 450 mm × 450 mm supports an axial load 1600 kN. Design a square footing for a column. The safe bearing capacity of the soil is 250 kN/m<sup>2</sup>. Use M-25 Concrete and Fe-415 Grade Steel.
- (c) A brick masonry wall 230 mm thick carries a load of 370 kN/m inclusive of its own weight. Design the footing of wall. Take bearing capacity of soil as 150 kN/m<sup>2</sup> at 1 m depth. Use M-20 Concrete and Fe-415 Grade Steel.

3. Attempt any *two* parts of the following : (10×2=20)

- (a) Design the stem of a RC cantilever retaining wall, retaining leveled earth 5 m above base level. Take the density of earth as 18 kN/m<sup>3</sup> and angle of repose as 30°. Toe projection 1.8 m, heel projection 1.7 m and thickness of base slab as 450 mm.
- (b) Compute the maximum bending moment for a culvert for the following data :

Loading = class AA tracked vehicle

Clear span = 6 m

Clear width of road way = 7.5 m

Average thickness of wearing coat = 80 mm

The width of bearing = 0.4 m

L'/L	1.0	1.1	1.2	1.3
K for simply supported	2.48	2.60	2.64	2.72

- (c) What are the various components of cantilever retaining wall? Explain the concept of its design.

4. Attempt any *two* parts of the following : (10×2=20)

- (a) Design the wall of a circular tank of 7 m diameter and 4 m height. The tank is fixed at base and resting on ground. Sketch the details.
- (b) The inner dimensions of an intake tank are as shown in Fig. 4(a). Design top dome, top ring beam and side wall. Use M-25 Concrete and Fe-415 Grade Steel.

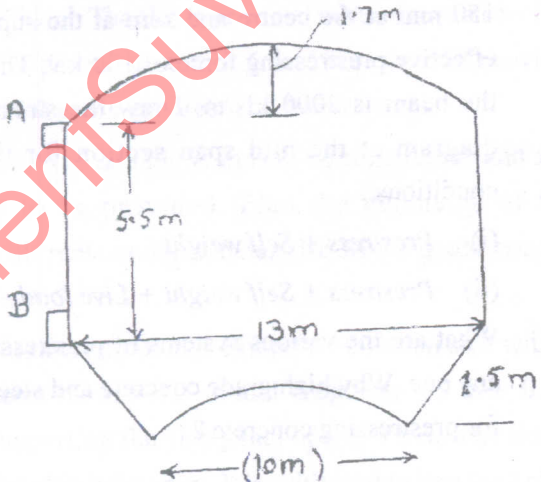


Fig. 4(a)

(c) Discuss the following in design of water tanks :

(i) Permissible stresses in the reinforcement

(ii) Joints in tanks.

5. Attempt any *two* parts of the following : (10×2=20)

(a) A prestressed concrete beam of rectangular section 120 mm wide and 300 mm deep is prestressed by 6 wires of 6 mm diameter, provided at an eccentricity of 55 mm. The initial stress in the wire is  $1150 \text{ N/mm}^2$ . Find the loss of stress due to creep of concrete. Take  $E_s = 2 \times 10^5 \text{ N/mm}^2$ ,  $E_c = 3 \times 10^4 \text{ N/mm}^2$  and creep coefficient of concrete = 1.5.

(b) A beam of symmetrical I section spanning 8 m has a flanged width of 200 mm and a flange thickness of 60 mm respectively. The overall depth of the beam is 400 mm. Thickness of the web is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre and zero at the supports with an effective prestressing force of 100 kN. The live load on the beam is 2000 kN/m. Draw the stress distribution diagram at the mid span section for the following conditions :

(i) *Prestress + Self weight*

(ii) *Prestress + Self weight + Live load.*

(c) What are the various systems of prestressing ? Explain any one. Why high grade concrete and steel are required for prestressing concrete ?