Printed Pages : 4 **ECE601**

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

PAPER ID : 2454 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

DESIGN OF CONCRETE STRUCTURES—II

TCE602

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

PAPER ID : 0058 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

CONCRETE STRUCTURE—II

Time : 3 Hours *Total Marks : 100*

Note :–Attempt **ALL** questions. Wherever required use reference sketches and draw reinforcement details. Assume any missing data if required. Use of IS : 456–2000 is allowed.

1. Attempt any **TWO** of the following :— **(10×2=20)**

   (a) A flat plate (slab) with 7·5 × 6 m panels on 500 × 500 mm columns has a slab thickness of 185 mm, designed for a total characteristic load (DL+LL) of 9·3 kN/m². Check the safety of the slab in shear (one way and punching shear) if M25 grade concrete and HYSD Fe415 grade steel are used for its construction. State also, how we can increase the shear capacity of the slab.

   (b) Calculate the bending moments and draw the bending moment diagrams in an interior panel of a flat slab with panel size 6 m × 6 m supported by columns of size 500 mm × 500 mm × 500 mm. Provide suitable drop (no column head). Take live loads as 4 kN/m². Use M20 grade concrete and HYSD Fe 415 grade steel.

(c) Explain under which conditions the equivalent frame method of analysis is used for analysis of flat slab ? Briefly explain the method.

2. Attempt any **FOUR** of the following :— **(4×5=20)**

(a) Discuss the advantages of using the pedestal under a column and explain under what conditions dowel bars are required in design of footings.

(b) Under what conditions a combined footing is needed ? Explain the design principles of combined footing with help of neat sketches.

(c) Discuss the factors on which the depth of foundation is fixed for a building.

(d) Determine the plan dimensions of a R.C.C. footing for a column subjected to a characteristic load of 1000 kN and moment about major axis M_x = 180 kN-m. The size of the column is 300 mm × 750 mm. The safe bearing capacity of soil is 200 kN/m^2.

(e) An R.C.C. wall of length 6 m is subjected to a load of 200 kN/m. Determine the width of footing and net upward soil pressure on footing. The safe bearing capacity of soil is 200 kN/m^2 at 1·3 m depth.

(f) Find the plan size of square footing and total depth of footing required from shear point of view for a footing of uniform depth, supporting R.C.C. square column of size 500 mm, transmitting an axial service load of 2700 kN. The safe bearing capacity of soil at site is 160 kN/m^2. Use M20 concrete and HYSD Fe 415 grade steel. Draw the neat sketch of footing showing calculated dimensions.

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

(a) Discuss the stability requirements for a retaining wall and explain with help of neat sketch the structural load transfer mechanism, reinforcement and conditions of uses of a counterfort R.C.C. retaining wall.

(b) Fix the preliminary dimensions of a cantilever retaining wall and check the stability of the retaining wall to retain an earth embankment with a horizontal top, 3·5 m above ground level. Take density of earth as 18 kN/m³. Angle of internal friction $\phi = 30°$. Safe bearing capacity of soil at 1·25 m depth is 200 kN/m². Take coefficient of internal friction between soil and concrete equal to 0·5. Adopt M20 grade concrete and HYSD Fe 415 grade steel.

(c) Fix the preliminary dimensions and check the stability of a counterfort retaining wall of height 5·5 m above the ground level. The safe bearing capacity of soil is 180 kN/m² at 1·3 m depth. The angle of friction $\phi = 30°$ and unit weight of back-fill is 18 kN/m³. Assume the spacing of counterforts as 3 m c/c. Coefficient of friction between soil and concrete $\mu = 0·5$. Adopt M20 grade concrete and HYSD Fe 415 grade steel.

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

(a) Discuss the special considerations required for making reinforced concrete water tanks. Explain the strength and serviceability design requirements of water retaining structures recommended by IS Codes.

(b) Fix the preliminary dimensions of an intz type water tank. Design and show the reinforcement details of top dome, top ring beam, cylindrical wall and bottom ring beam. The data given is :

Capacity of water tank = 1000 m³

Height of staging = 18 m above G.L. upto bottom of container.

Safe bearing capacity of soil = 235 kN/m² at 2·8 m depth.

Materials used = M20 concrete and HYSD Fe 415 grade steel.

(c) A R.C.C. curved beam circular in plan is loaded with uniform load of 140 kN/m inclusive of self weight. The radius of beam is 4 m. The beam is supported on six symmetrically placed columns. Design the beam at critical sections for bending, Torsion and shear and show the reinforcement details in ring beam. Take values of :

$K_1 = 0{\cdot}089$, $K_2 = 0{\cdot}045$ and $K_3 = 0{\cdot}009$ and $\beta = 12{\cdot}75°$. Where K_1, K_2, K_3 are B.M. coefficients and Torsion co-efficients. β = angle at which Torsion is max.

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

(a) Explain with neat sketches the basic principles of pre-stressed concrete subjected to (l) axial prestressing (μ) eccentric prestressing. Also discuss the necessity of using high strength concrete and high tensile steel in prestressed concrete works.

(b) Distinguish between pretensioned and post-tensioned prestressed members and explain with help of neat sketches the various post tensioning anchorage devices.

(c) A prestressed concrete pile 250 mm square, contains 60 pretensioned wires, each of 2 mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestressing bed. With a total force of 300 kN. Calculate the final stress in concrete and percentage loss of stress in steel after all losses.

Given the following data :—

$E_s = 210$ kN/mm²

$E_c = 32$ kN/mm²

Shortening due to creep = 30×10^{-6} mm/mm per N/mm² of stress

Total shrinkage = 200×10^{-6} per unit length relaxation of steel stress = 5% of initial stress.