BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
B.E. (Civil Engg.), Part –III, 5th Semester Final Examinations, 2011
Sub: Design of R.C. Structures (CE-501)

Time: 3 hours **Full Marks: 70**

Use separate answer script for each half.
*Answer any **Six** question, taking **Three from each half.***
Two marks are reserved for neatness. Assume any data reasonably, if required. All the notations used have their usual meanings.
Use M 20 concrete and Fe 415 steel.

First half
Use Limit State Method

1. The T- beams in the first floor of a hall are of 5.0 m effective span and are spaced 3.0 m centre to centre. The over all size of the T-beams are 250 mm wide and 400 mm deep, The thickness of the roof slab is 120 mm. Design and detail the beam in flexure and flexural shear when the floor is subject to an unfactored live load of 2.5 kN/m^2. Floor finish is of 40 mm thickness (unit weight 24.0 kN/m^3). Assume τ_c = 0.58 N/mm^2. 11

2. Design and detail a simply supported doubly reinforced beam having an effective span of 4 m. The unfactored superimposed load is 40 kN/m and size of beam is limited to 250 mm x 400 mm. Also design for shear. Assume τ_c = 0.6 N/mm^2 11

3. Design and detail the corner slab of an office building with effective grid dimensions 5.0 m x 4.0 m. Assume live load on slab as 4 kN/m^2 and modification factor = 1.5. Short span co-efficients, α_x are as follows :-

l_y/l_x	1.0	1.1	1.2	1.3
(-)ve Moment at Continuous edge	0.047	0.053	0.060	0.065
(+)ve Moment at Midspan	0.035	0.040	0.045	0.049

11

4. A R.C.C. column of size 450 mm x 450 mm is provided with 2 % steel distributed equally on four sides with nominal cover of 40 mm. Determine the ultimate load and ultimate uniaxial moment carrying capacity of the section. Assume neutral axis at the edge of the cross-section.

Stress –strain relationship of Fe 415 grade of steel:

Strain (10^{-5})	144	163	192	241	276	380
Stress (MPa)	288.7	306.6	324.8	346.1	351.8	360.9

11

5. A square column 400 mm x 400 mm carries a factored axial load of 1200 kN. Design and detail an isolated footing to support the column. The safe bearing capacity of soil is 200 kN/m^2. Assume τ_c = 0.6 N/mm^2. 11

Second half

Use Working Stress Method.

6. a) Design and detail in flexure a simply supported reinforced concrete beam of effective span 4 m when subjected to a uniformly distributed load of 40 kN/m inclusive of self weight. The width and depth of beam are restricted to 300 mm and 500 mm, respectively.
   b) State the assumptions for the design of members by the Working stress method. 7+4

7. Design and detail a R.C. floor slab for a room having effective lengths 2.8 m X 6.3 m, simply supported on all four sides over 250 mm thick walls. The slab carries 40 mm (average) thick floor finish at its top (unit weight 24 kN/m^3) and the live load on the slab may be taken as 4 kN/m^2. The modification factor may be taken as 1.6. 11

8. A T-beam has flange width 900 mm, depth of flange 100 mm, width of rib 250 mm and tensile reinforcement 3 nos. 20 mm diameter bars in the bottom of rib. The overall depth is 500 mm and the nominal cover is 25 mm. Calculate the superimposed load it can carry over a simply supported effective span of 4 m. Neglect compression of the rib. 11

9. A circular R.C. column with helical reinforcement is to support a load of 1500 kN inclusive of its own weight. The column is effectively held in position at both ends and restrained against rotation at one of the ends. The unsupported length of the column is 5.0 m. Design and detail the column. 11

10. Design and detail (for flexure only) a combined rectangular footing for two columns C1 and C2, carrying loads of 900 kN and 1100 kN respectively. Column C1 is 450 mm x 450 mm in size and column C2 is 600 mm x 600 mm in size. The c/c spacing of the columns is 4.0 m. The safe bearing capacity of soil may be taken as 170 kN/m^2. 11