CT-504/DORCCS/5th Sem/2017/M

DESIGN OF RCC STRUCTURE

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. A reinforced concrete beam section of size $250\,mm \times 500\,mm$ is reinforced as follows :

   (i) 4 numbers of 12 mm diameter bars

   (ii) 3 numbers of 20 mm diameter bars.

   For each case determine the extreme fibre stresses and allowable moment of resistance assuming M20 grade concrete and Fe 415 steel.   14

2. What is meant by limit state ? Discuss the different limit states to be considered in reinforced concrete design. A beam section is reinforced with 4 numbers of 25 mm diameter bars. Assuming M25 grade concrete and Fe 415 steel, determine the ultimate moment of resistance.   14

[Turn over

3. Determine moment of resistance of the beam section shown is figure-1, considering M25 concrete and Fe 415 steel. 14
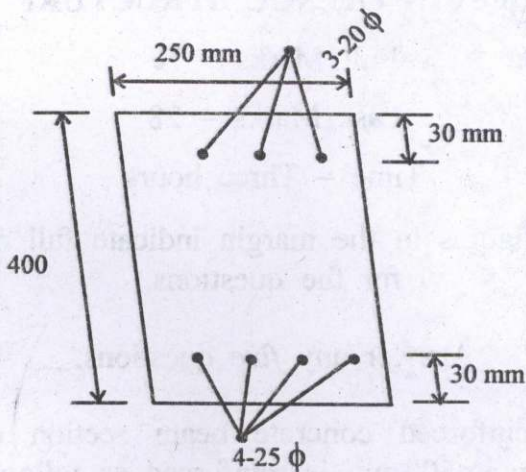

Fig. 1

4. Define development length. What are the mechanisms by which bond resistance is mobilised in reinforced concrete ? Explain clearly the difference between flexural bond and development bond. Calculate development length (L_d), if the diameter of bar is 10 mm for M20 grade concrete and Fe 415 steel.   2+5+4+3=14

5. (a) What do you mean by one-way slab and two-way slab ? Explain clearly the difference in the behaviour of one-way slabs and two-way slabs. 8

   (b) What is meant by slenderness ratio of a compression member ? Distinguish between unsupported length and effective length. 6

6. What do you mean by balanced, under-reinforced and over-reinforced section ? Explain them with figures. For a rectangular beam section, find the depth of neutral axis (x_u). Write the steps involved in finding x_u ; when $x_u > x_{u, max}$ where $x_{u, max}$ is limiting neutral axis depth. Define clear cover and effective depth of a rectangular beam section.

   14

7. Explain the concept of 'transformed section' as applied to the analysis of reinforced concrete beam under service load. What is modular ratio and cracking moment in a reinforced concrete ? How does creep of concrete affect the modular ratio ?

   14