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09ENG5.5

Fifth Semester B. Arch. Degree Examination, Dec.2014/Jan.2015
Structures – V

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions.***
2. Use of IS 456 and SP – 16 is permitted.
3. Missing data, if any, may be suitably assumed.

1 a. Explain workability of concrete. **(05 Marks)**
b. Explain water cement ratio and shrinkage. **(10 Marks)**
c. How do you grade cement, concrete and steel? List any two grades of concrete and steel. **(05 Marks)**

2 a. Distinguish between balanced, under reinforced, over reinforced sections, with neat sketch. **(08 Marks)**
b. A singly reinforced concrete beam is of width 450 mm and effective depth 715 mm. It is reinforced with 8 nos. 20 mm mild steel bars. Assuming grade 15 concrete determines its moment of resistance according to the working stress method. Also determine the stress in steel when the beam is subjected to the above moment. **(12 Marks)**

3 a. Derive from first principles $MR = Qbd^2$, where M = Bending moment, Q = Moment of resistance factor. **(08 Marks)**
b. A beam section 300 mm wide and 560 mm deep is reinforced with 4 bars of 25 mm diameter in the tensile zone and 4 bars of 12 mm diameter in the compression zone. The cover to the centre of both the reinforcement is 40 mm. Determine the moment of resistance of the section, if M20 concrete and HYSD bars are used. Adopt working stress method. **(12 Marks)**

4 a. Explain the philosophy of limit state method of design. **(06 Marks)**
b. Design a singly reinforced concrete beam of clear span 5 m to support a design working live load of 10 kN/m. Adopt M20 grade concrete and Fe415 HYSD bars. Adopt limit state method. **(14 Marks)**

5 Design a one way slab for a room 4m × 10 m supported on masonry walls 230 mm thick to carry live load of 3 kN/m^2. Use M20 and Fe415. Adopt limit state method. **(20 Marks)**

6 Design a reinforced concrete slab 6.3 × 4.5 m simply supported on all the four sides. It has to carry a characteristic live load of 10 kN/m^2 in addition to its dead weight. Assume M25 concrete and Fe415 steel, also assume that the exposure condition to environment can be classified as mild. **(20 Marks)**

7 a. A short reinforced rectangular column of size 300 × 500 mm is subjected to an axial compressive factored load of 200 kN and a factored moment of 250 kN-m about the major axis. Adopting M25 grade concrete and Fe415 HYSD bars, determine the reinforcement in the column section. **(10 Marks)**

b. A reinforced concrete column 400 mm by 400mm supports an axial service load of 1000 kN. The safe bearing capacity of the soil at site is 200 kN/m^2. Adopting M20 grade concrete and Fe 415 HYSD bars, design a suitable footing for the column and sketch the details of reinforcements. **(10 Marks)**

8 Design one of the flights of stairs of a school building spanning between landing beams to suit the following data :
Type of staircase – Waist slab type
Number of steps in flight - 12
Tread T = 300 mm
Riser R = 160 mm
Width of landing beams = 400 mm
Materials = M20 concrete Fe415 HYSD bars. **(20 Marks)**

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