COURSE CODE (CREDITS): 18B11CE515   MAX. MARKS: 35

COURSE NAME: DESIGN OF CONCRETE STRUCTURES

COURSE INSTRUCTORS: Dr. TANMAY GUPTA   MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Utilization of code IS 456 is allowed.

Q1. (a) Explain the phenomenon of load distribution in one-way and two-way slab with diagram.

(b) Write IS 456: 2000 recommendations for the lateral reinforcement in columns.   [3+2] [CO2]

Q.2 (a) Write down all the parameters of Limit state of serviceability and explain any two in detail.

(b) Distinguish between balanced, over-reinforced and under-reinforced sections in limit state design. Which of these should be recommended in design?   [3+2] [CO1]

Q.3 Find the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 4 bars of 16 mm diameter of Fe415 steel. Take M20 concrete. Redesign the beam if necessary.   [3] [CO2]

Q.4 (a) Design the shear reinforcement for a beam with b= 350 mm, d= 550 mm, V_u= 125 kN, f_{ck}= 25 N/mm^2 , f_y= 415 N/mm^2. Percentage of steel is 1.67 percent.

(b) Define development length and derive an expression for development length.   [3+3] [CO3]

Q.5 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 Fe 415 steel; also assume mild exposure conditions.   [5] [CO2]

Q.6 Sketch typical reinforcement detail and plan details in tread-riser type stairs.   [4] [CO4]

Q.7 Design a short circular column of effective length 3.3m to carry an axial load of 1200 kN. Provide helical reinforcement as transverse reinforcement. Use M25 concrete and Fe415 steel.   [3][CO2]

Q.8 Determine the reinforcement required of a rectangular beam with b = 400 mm, d = 650 mm, D = 700 mm and subjected to factored M_u = 200 kNm, factored T_u = 50 kNm and factored V_u = 100 kN. Use M 20 and Fe 415 for the design.   [4] [CO5]