Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 40316

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh Semester

Civil Engineering

CE 8703 — STRUCTURAL DESIGN AND DRAWING

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) Design and detail a suitable structure to retain sand for 4 m above the ground. The sand fill slopes at the rate of 1 vertical to 2 horizontal. The weight of the sand is 18 kN/m³. The angle of repose is 30°. The SBC of the soil is 200 kN/m² at 1,25m below the GL. Use M25 concrete and Fe415 reinforcement.   (20)

Or

    (b) Design a counterfort type retaining wall to suit the following data :

         Height of wall above ground level = 6.2 m; S.B,C. of soil at site = 160 kN/m²; Angle of internal friction = 35°; Density of soil = 17 kN/m³; Spacing of counterfort = 3.5 m c/c; Materials: M20 grade concrete, Fe415 HYSD bars.   (20)

2. (a) A building of floor size 12 m × 15 m is to be constructed for a parking area with interior panels of size 3 m × 3 m. The floor is to support live and partition loads of 3 kN/m² and 1 kM/m² respectively at the service state, Use M25 grade concrete and Fe415 steel, suggest a suitable floor system for a maximum utilization of height and detail the reinforcements for an interior panel.   (20)

Or

    (b) Design a RCC T-beam girder bridge to suite the following data :

         Clear width of roadway – 7.5 m; Span – 16 m (c/c of bearing); Live load – IRC class AA loading; Design the Deck slab, Main girder and Cross girder. Also, sketch the details of reinforcement.   (20)

3. (a) Design and detail the walls of a rectangular water tank of internal dimensions 7 m × 3 m × 2 m to be provided underground. The angle of repose may be taken as 9° (wet) and 33° (dry). Use M25 concrete and Fe415 grade steel. (20)

Or

(b) An overhead service reservoir of Intz type is to be constructed to store water of 1 million litre capacity. Estimate the economical dimensions of the tank, Also, design and detail the top dome, top ring beam, cylindrical tank wall of the tank. Use M25 grade concrete and Fe415 grade steel. (20)

4. (a) A beam-column joint is subjected to a factored axial load of 500 kN (tension) in addition to the factored moment acting at top and bottom of the column of 30 and 50 kN-m respectively. Effective length of the column may be taken as 3.2 m and that the column is restrained in position at both ends but free to rotate at one end. Assuming f_y = 250 N/mm², design the beam-column section and check the same to conform to the specifications of the code. Sketch the details of the column. (20)

Or

(b) The roof of a workshop shed measuring 10 m × 20 m is to be covered using steel tubular trusses and AC sheets. The effective span between the columns is 10 m and the spacing of trusses is 4 m. Design the tubular steel roof truss conforming to IS standards. Assume the wind pressure at site as 1.5 kN/m². Draw the elevation of the truss and detail any two joints. (20)

5. (a) A girder is simply supported over a span of 27 m and supports a uniformly distributed live load of 20 kN/m, together with two concentrated loads of 450 kN each located at 6m from either supports. If the top compression flange is restrained laterally, design the cross section with a thinner web and suitable stiffeners of a welded plate girder using Fe 410 grade steel confirming to the codal specifications. Sketch the details of the plate girder. (20)

Or

(b) A simply supported crane gantry girder is to be designed to support an overhead travelling crane using the following data :

Crane load lifting capacity = 300 kN; Weight of crane girder and crab = 250 kN: Distance between centre of gantry rails = 15 m; Minimum approach of crane hook = 1.2 m; Distance between centre of crane wheels = 3.5 m; span of gantry girder = 5 m; weight of rail section = 0.3 kN/m; Height of rail section = 75 rim; yield stress of steel = 250 MPa. Design the gantry girder and sketch the details of the cross section. (20)

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