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**Question Paper Code : X10255**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020  
Seventh Semester  
Civil Engineering  
CE 8703 – STRUCTURAL DESIGN AND DRAWING  
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

*Use of IS 456 – 2000, IS 800 – 2007, IS 875 (Part 3) – 2003, IS 3370 (part 2) – 2009, IS 3370 (Part 4) – 2008, IS 4998 – 2003, IS 6533 (Part 1) – 2010, IS 6533 (Part 2) – 2003.*

*IRC 6 – 2014, IRC 21 – 2000, and steel tables is permitted.*

Relevant data may be suitably assumed if found necessary.

Answer ALL questions

**(5×20=100 Marks)**

1. a) Design the stem for a cantilever retaining wall to retain earth of 4m height. The backfill is horizontal. The unit weight of soil is  $17\text{kN/m}^3$ . Coefficient of friction between soil and concrete is 0.5. Safe bearing capacity of soil is  $200\text{kN/m}^2$ . The angle of repose is  $30^\circ$ . Use M35 grade concrete and Fe415 grade steel.

(OR)

- b) Find the dimensions of a counterfort retaining wall to retain earth of 8 m height. The unit weight of soil to be retained is  $16\text{kN/m}^3$ . Coefficient of friction between soil and concrete is 0.6. Safe bearing capacity of soil is  $200\text{kN/m}^2$ . The angle of repose is  $30^\circ$ . Use M40 grade concrete and Fe415 grade steel. Check the stability of the wall.

2. a) Design a slab bridge using M35 grade concrete and Fe415 steel for IRC 70 loading. Consider the following data

Clear span - 7m

Carriage way - 12m

Thickness of wearing coat - 80 mm

Draw to a suitable scale the cross-section showing the reinforcement details.

(OR)



- b) Design an interior panel of a flat slab of panel size  $5\text{m} \times 5\text{m}$  supported by columns of size  $450\text{ mm} \times 450\text{ mm}$ . Provide suitable drop. Take live load as  $3\text{kN/m}^2$ . Use M30 grade concrete and Fe 415 grade steel.
3. a) Design a circular tank 10 m diameter and 3 m height of wall Free board = 0.3 m. The tank rests on a firm ground. The walls are fixed at the base and free at the top. Use M30 and Fe415 rebars.

(OR)

- b) Design a rectangular underground tank for a capacity of 30 kilo litres. Use M30 and Fe415 rebars.
4. a) Design a i-section purlin for a steel roof truss for the following data
- |  |                              |
|--|------------------------------|
| Span of roof                                 | = 9m                         |
| Spacing of purlins along slope or truss      | = 2m                         |
| Spacing of truss                             | = 3m                         |
| Slope of roof truss                          | = 1 vertical to 2 horizontal |
| Wind load normal to roof on the roof surface | = $1.5\text{ kN/m}^2$        |
| Vertical load from roof sheet                | = $0.2\text{ kN/m}^2$        |
- Sketch the details of the roof.

(OR)

- b) Design a bolted connection to transfer a factored end reaction of 120 kN from the beam (ISMB250) to the flange of a column (ISHB200). Use Fe410 grade steel and bolts of grade 4.6.
5. a) Design a welded plate girder of span 30 m to carry a live load of  $40\text{ kN/m}$ . Use steel of grade Fe410. Avoid use of bearing and intermediate stiffeners. Draw the cross-section and longitudinal elevation of the girder.

(OR)

- b) An ISMB500 frames into an ISHB300. The factored end shear force is 300kN and the factored end moment is 90 kNm. Design a suitable moment resistant connection assuming site welding.
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