27 APR 2023

| Reg. No. | | | | | | | | | | | | |
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| Question Paper Code | 11819 |
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023**

Seventh Semester

**Civil Engineering**

**CE8703 - STRUCTURAL DESIGN AND DRAWING**

(IS 800:2007, IS456:2000, IS3370: Part 1 & 2 and Steel Tables are permitted)

(Regulations2017)

Duration: 3 Hours | Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

| | | *Marks, K-Level, CO* |
|---|---|---|
| 1. | What are the types of retaining wall? | *2,K1,CO1* |
| 2. | When is the design of shear key necessary? | *2,K1,CO1* |
| 3. | What is flat slab and give the different types? | *2,K1,CO2* |
| 4. | Give the names of various types of bridges. | *2,K1,CO3* |
| 5. | What are conditions under which the walls of underground water tanks designed? | *2,K1,CO4* |
| 6. | What are the types of reinforced concrete water tanks? | *2,K1,CO4* |
| 7. | What are the types of steel roof trusses? | *2,K1,CO5* |
| 8. | Define Beam Column. | *2,K1,CO5* |
| 9. | Where the gantry girders are used? | *2,K1,CO6* |
| 10. | Define Stiffener. | *2,K1,CO6* |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

| | | | |
|---|---|---|---|
| 11. | 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 17kN/m$^3$. Coefficient of friction between soil and concrete is 0.5. Safe bearing capacity of soil is 200kN/m$^2$. The angle of repose is 30°. Use M20 grade concrete and Fe415 grade steel. | *13,K3,CO1* |
| | | **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 kN/m$^3$. Coefficient of friction between soil and concrete is 0.6. Safe bearing capacity of soil is 200kN/m$^2$. The angle of repose is 30°. Use M40 grade concrete and Fe415 grade steel. Check the stability of the wall. | *13,K3,CO1* |
| 12. | a) | Summarize the design steps for interior panel design of a flat slab in detail. | *13,K2,CO2* |

**OR**

b) Design an interior panel of a flat slab of panel size 5m × 5m supported by columns of size 450 mm × 450 mm. Provide suitable drop. Take live load as 3kN/m$^2$. Use M30 grade concrete and Fe 415 grade steel. *13,K3,CO2*

13. 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. *13,K3,CO4*

**OR**

b) Design a rectangular underground tank for a capacity of 30000 litres. Use M30 and Fe415. Assume suitable data. *13,K3,CO4*

14. a) Design an I-section for an industrial building to support a galvanized corrugated iron sheet roof. *13,K3,CO5*
Spacing of the trusses = 5.0 m
Spacing of purlin = 1.5 m
Inclination of main rafter to horizontal = 30°
Weight of galvanized sheets taking into account laps and connecting bolts= 130N/m$^2$
Imposed snow load = 1.5kN/m$^2$
Wind load = 1.0 kN/m$^2$

**OR**

b) A beam-column of effective length of 6 m carries an axial load of 450kN and equal end moments of 50kN-m each about the major axis. Design the H-Section of the Column. Assume that members in the frame where side sway is prevented and not subjected to transverse loading between their supports and column bends either in single or in double curvature. *13,K3,CO5*

15. a) 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. *13,K3,CO6*

**OR**

b) Design a welded plate girder of span 30 m to carry a live load of 40 kN/m. Use steel of grade Fe410. Avoid use of bearing and intermediate stiffeners. Draw the cross-section and longitudinal elevation of the girder. *13,K3,CO6*

**PART - C (1 × 15 = 15 Marks)**

16. 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. *15,K3,CO3*

**OR**

b) Explain the step by step procedure involved in design of a RC solid slab bridge. *15,K2,CO3*