

**B.E DEGREE EXAMINATIONS: NOV / DEC 2010**

Seventh Semester

**CIVIL ENGINEERING**

U07CE701: Design of Reinforced Concrete Structures

(Relevant IS codes are permitted)

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL the Questions:**

**PART A (10 x 1 =10 Marks)**

1. The most important factor affecting the strength of concrete is the
  - A) Weather conditions during curing
  - B) Volume of the mixture
  - C) Water to cement ratio
  - D) Amount of vibration of the mix
2. Ultimate limit state is performed to
  - A) Collapse
  - B) Weak
  - C) Strong
  - D) Deflection
3. Deflection is categorised and checked in accordance to the
  - A) Working stress
  - B) Limit state
  - C) Safety
  - D) Deflection
4. The minimum % of steel used in Fe415 for Retaining wall is
  - A) 0.12
  - B) 0.15
  - C) 0.20
  - D) 0.25
5. Given,  $f_y=250 \text{ N/mm}^2$ ,  $\gamma=1.15$  what is the steel design strength?
  - A) 217.39  $\text{N/mm}^2$
  - B) 200.39  $\text{N/mm}^2$
  - C) 217.08  $\text{N/mm}^2$
  - D) 200.08  $\text{N/mm}^2$
6. Structural concrete should have the following except
  - A) Durable
  - B) Commercial value
  - C) Resistance to moisture
  - D) Fire resistance
7. The most frequently used footing type at the exterior wall for load bearing wall support system
  - A) Mat footing
  - B) Pile footing
  - C) Continuous wall footings
  - D) Isolated pad footings
8. Which of the following is not a primary structural system that is employed to resist lateral loads?
  - A) Shear walls
  - B) Braced frames
  - C) Hinged frames
  - D) Moment resisting frames
9. The maximum rise recommended for public stair steps is
  - A) 100 mm
  - B) 150 mm
  - C) 200 mm
  - D) 250mm
10. The minimum width of tread in public building is
  - A) 150 mm
  - B) 200 mm
  - C) 250 mm
  - D) 300 mm

**PART B (10 x 2 = 20 Marks)**

11. What do you mean by surcharge in retaining wall design?

12. What is the necessity of shear key in retaining walls?
13. What is characteristic strength of concrete?
14. What are the different types of stair cases?
15. Explain in brief the staging of water tanks.
16. What are the forces considered for design of under ground water tank?
17. How will you calculate the development length  $L_d$  in the slab?
18. When are mat foundation adopted
19. Sketch the types of loading for Box culvert.
20. What are the different types of bridges?

**PART (5 x 14 = 70 Marks)**

21. a) (i) Explain the types of retaining walls (4)
- (ii) Design the stem of cantilever retaining wall to retain earth for a height of 5m. The density of the soil is  $16\text{kN/m}^3$ . The back fill is horizontal and angle of repose of soil is 30 degree. The co-efficient of friction between base concrete and soil is 0.58. Use M20 and Fe415. Safe bearing capacity is  $160\text{kN/m}^2$ . (10)

**(OR)**

- b) Design the stem of cantilever retaining wall to retain the earth for a height of 5m. The density of the Soil is  $16\text{ KN/m}^3$ . The SBC of the soil is  $160\text{ KN/m}^2$ . The angle of internal friction of soil is  $30^\circ$ . The coefficient of friction at base between concrete and soil is 0.5. The backfill is horizontal and is loaded with a uniform surcharge of  $20\text{ KN/m}^2$ . Use M20 grade concrete or Fe 415 grade steel.

22. a) (i) Differentiate between circular and rectangular water tank. (4)
- (ii) Design a ground level circular water tank to store a capacity of 4 lakh litres. The base of the tank is flexible. Use M20 grade concrete or Fe 415 grade steel. (10)

**(OR)**

- b) Design a spherical dome for a circular room 10 m in diameter with 200 mm thick side wall. Assume live load due to wind and accidental loading as  $2600\text{ N/m}^2$  on surface area and allowable stresses in tension in concrete as  $2\text{ N/mm}^2$  and compression in concrete as  $5\text{ N/mm}^2$  and tension and compression in steel as  $120\text{ N/mm}^2$ . Assume rise of the dome as 2m.

23. a) Design an elevated Rectangular water tank of size  $10\text{m} \times 4\text{m} \times 3\text{m}$  height excluding the free board of 0.2m. The tank is supported on masonry wall alone. The tank is also provided with a dome of 1m height.

**(OR)**

b) Design only the long wall. Use m20 & Fe415 for the above problem, design the short wall.

24. a) Design a dog legged staircase for the storey height of 3m. Assume the width of the staircase is 1m. The width of the landing slab is also 1m. Use M20 and Fe415.

**(OR)**

b) The given Figure.1 shows the locations of columns and the loads on them at foundation level. The bearing capacity of the soil is 50,000 N/mm<sup>2</sup>. Design a suitable raft foundation. Assume allowable stress as 7 N/mm<sup>2</sup> and  $\sigma_{st} = 140$  N/mm<sup>2</sup>.

25. a) Design slab bridge for the following requirements.

Clear span = 6m

Clear width of carriage way = 7.5m

Live load class-A loading

Use concrete mix M20 and

$\sigma_{st} 200$  N/mm<sup>2</sup> for deformed bars (as per IRC)

**(OR)**

b) Design the Top wall of culvert of size 3m x 3m. Assume suitable datas. Take live load as 25kN/mm<sup>2</sup> use m25 & Fe415.

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