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Question Paper Code: 47102

B.E./B.Tech. DEGREE EXAMINATION, NOV 2018

Seventh Semester

Civil Engineering

14UCE702 -ADVANCED STRUCTURAL DESIGN

(Regulation 2014)

(Note: Use of IS 456:2000, SP 16:1980, IS 3370(Part –II):2009, IS 3370(Part –IV):1967, IS 800:2007, SP 6-1:1964 and IRC 21:2000 are permitted in the End Semester Examinations)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

(Answer all Questions)

- High strength bolts are designed on the basis of
(a) Friction (b) Tension (c) Compression (d) Shear
- The maximum area of tension reinforcement in beams shall not exceed
(a) 0.15 % (b) 1.5 % (c) 4 % (d) 1 %
- The width of the flange of a T-beam should be less than
(a) one-third of the effective span of the T-beam
(b) distance between the centres of T-beam
(c) breadth of the rib plus twelve times the thickness of the slab
(d) least of the above
- The bending moment at center span of water tank slab is
(a) $pL^2/16$ (b) $pB^2/16$ (c) $pB^2/12$ (d) $pB^2/8$
- If the average bending stress is 6 kg/cm^2 for M 150 grade concrete, the length of embedment of a bar of diameter d according to I.S. 456 specifications, is
(a) 28 d (b) 38 d (c) 48 d (d) 58 d

6. Bottom bars under the columns are extended into the interior of the footing slab to a distance greater than
 - (a) 42 diameters from the centre of the column
 - (b) 42 diameters from the inner edge of the column
 - (c) 42 diameters from the outer edge of the column
 - (d) 24 diameter from the centre of the column

7. The method of design of steel framework for greatest rigidity and economy in weight, is known as
 - (a) simply design
 - (b) semi-rigid design
 - (c) fully rigid design
 - (d) none of the above

8. The permissible shear stress for fitted weld is
 - (a) 100 N/mm²
 - (b) 110 N/mm²
 - (c) 120N/mm²
 - (d) 150 N/mm²

9. The distance between, rivet line and the nearest edge of a joint not exposed to weather, is taken (where t is thickness in mm of the thinner outside plate).
 - (a) 10 t
 - (b) 8 t
 - (c) 6 t
 - (d) 12 t

10. Which of the following is not a compression member?
 - (a) Strut
 - (b) Tie
 - (c) Rafter
 - (d) Boom

PART – B (5 x 2= 10Marks)

11. What are the factors that govern will govern the structural design?
12. Mention the reinforcement details that should be provided in a water tanks.
13. Give the names of various types of bridges.
14. State the necessity of providing shear key in retaining wall.
15. Enumerate the principle of design of a purlin.

PART – C (5 x 16= 80Marks)

16. (a) Design the Lap joint for the plates of sizes 100 × 16 mm and 100 × 10 mm thick connected so as to transmit a factored load of 100 kN using single row of 16 mm diameter bolts of grad 4.6 and plate of 410 grade (16)

Or

- (b) (i) State types of bolted joints and types of failure in case of bolted joints. (8)
- (ii) State two advantages of welded joints and two disadvantages of bolted joints. (8)
17. (a) Design an elevated cylindrical steel tank with hemispherical bottom for 1,60,000 liters capacity. The tank has conical roof. The ring beam of the tank is at a height of 10 m from the ground level. The tank is to be built at Chennai. Take $f_y = 250 \text{ N/mm}^2$ (16)
- Or
- (b) Design a RCC Box Culvert having a clear way of vent size 3.5m x 3.5m Live load and dead load on the culvert is 30kN/m^2 and 10kN/m^2 respectively. Unit weight of soil is 16kN/m^3 . Angle of repose is 30° . Use M20 grade of concrete and Fe415 grade steel. Assume any other data if necessary. (16)
18. (a) Design a solid slab bridge superstructure having a clear span of 9.0 m and carriageway of 7.5 m with 1.5 m wide footway on either side for a National Highway. Loading: Single lane of IRC Class 70-R (both wheeled and tracked) or two lanes of IRC Class A whichever produces maximum effect. (16)
- Or
- (b) Explain the design principle of reinforced concrete solid slab bridge and in which condition this bridge is used? (16)
19. (a) Design a cantilever retaining wall to retain earth embankment 4m height above ground level the density of earth is 18 kN/m^3 and its angle of repose is 30° . The embankment is horizontal at its top. The safe bearing capacity of the soil may be taken as 200 kN/m^2 and the co-efficient of friction between soil and concrete is 0.5. Adopt M20 grade concrete and Fe415 HYSD bars. (16)

Or

- (b) Design a cantilever retaining wall to retain earth embankment 4.5 m above the ground level. The density of earth is 18 kN/m^3 and its angle of repose is 30° . The embankment is horizontal at its top. The safe bearing capacity may be taken as 200 kN/m^2 and the coefficient of friction between soils and concrete is 0.5. Use M_{20} grade concrete and Fe 415 grade steel reinforcement. (16)

20. (a) Design an I section purlin for an industrial building to support a galvanized corrugated iron sheet roof. (16)
- Spacing of the trusses = 5.0m
Spacing of purlins = 1.5m
Inclination of main rafter to horizontal = 30°
Weight of galvanized sheet taking into account laps and connecting bolts = 130 N/m^2
Imposed load = 1.5 kN/m^2
Wind load = 1.0 kN/m^2

Or

- (b) Explain the design procedure of self-supporting steel chimney. (16)