Reg. No. : | | | | | | | | | | |

Question Paper Code: 47102

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

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)

1. In a combined footing if shear stress exceeds 5 kg/cm^2, the nominal stirrups provided are CO1- R

   (a) 6 legged (b) 8 legged (a) 6 legged

2. The maximum area of tension reinforcement in beams shall not exceed

   (a) 0.15 % (b) 1.5 % (c) 4 % (d) 1 %

3. 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

4. Cantilever retaining walls can safely be used for a height not more than

   (a) 3m (b) 4m (c) 5m (d) 6m

5. If *W* is the load on a circular slab of radius *R*, the maximum circumferential moment at the centre of the slab is

   (a) $3WR^2/16$ (b) $2WR^2/16$ (c) $3WR^3/16$ (d) $2WR^3/16$

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 spacing of purlins mainly depends on the

   (a) Applied load (b) Thickness of sheets (c) length of sheets (d) All of these

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. The size of fillet weld should not be less than

    (a) 3mm (b) 4mm (c) 6mm (d) 2mm

PART – B (5 x 2= 10Marks)

11. What are the advantages of welded joints?

12. Mention the reinforcement details that should be provided in a water tanks.

13. What are the forces acting on the dome?

14. State the necessity of providing shear key in retaining wall.

15. What are the four types of serviceability limit states applicable to steel structures?

PART – C (5 x 16= 80Marks)

16. (a) Design a cantilever retaining wall to retain earth embankment 4m height above ground level. The density of earth is 18kN/m^3 and its angle of repose is 30 degrees. 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 wall to retain earth 3m high above ground level. Use the following data: (16)

The density of earth = 18 kN/m^3

Angle of internal friction = 30^0

The safe bearing capacity of soil = 180 kN/m^2

The coefficient of friction between soil and concrete = 0.4

Use M20 and Fe415 grades.

17. (a) Design a circular tank with a flexible base for capacity of 500000 litres.The depth of water is to be 4m.Free board=200mm.Use M20 concrete and grade I steel.Permissible direct tensile stress in concrete =1.2N/mm^2.Permissible stress in steel in direct tension=100N/mm^2.Sketch the details of reinforcements in tank walls. (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 30̊. 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 counterfort type retaining wall to suit the following data: (16)

Height of wall above ground level = 6 m
S.B.C. of soil at site = 160 kN/m^2
Angle of internal friction = 33 degrees
Density of soils = 16 kN/m^3
Spacing of counterforts = 3 m c/c
Materials = M20 grade concrete
Fe415 HYSD bars
Sketch the details of reinforcements in the wall.

20. (a) A symmetric trusses of span 20m and height 5m are spaced at 4.5m c/c. Design channel section purlin to be placed at suitable distances to resist the following loads. (16)

Weight of sheeting including bolts: 171 kN/m^2
Live load: 0.4 kN/m^2
Wind load: 1.2 kN/m^2 (Suction)
Spacing of purlins: 1.4 m

Or

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