

B.Tech 7th Semester Exam., 2020

DESIGN OF CONCRETE STRUCTURE—II

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer of the following
(any seven) : $2 \times 7 = 14$

- (a) The static determinacy of two-hinge arch is
- (i) 1
 - (ii) 2
 - (iii) 0
 - (iv) 3

- (b) What is the IS Code used in design of water retaining structure?
- (i) IS 3370 : 2009
 - (ii) IS 456 : 2000
 - (iii) IS 1893 : 2002
 - (iv) IS 10262 : 2009
- (c) A two-hinge semi-circular arch of radius R carrying uniformly distributed load of W kN per unit length. The horizontal thrust is
- (i) $W / 2\pi$
 - (ii) $4WR / 3\pi$
 - (iii) $2WR / 3\pi$
 - (iv) W
- (d) In a spherical dome the hoop stress due to a concentrated load at crown is
- (i) compressive everywhere
 - (ii) tensile everywhere
 - (iii) zero
 - (iv) partly compressive and partly tensile

(Continued)

- (e) The impact factor for reinforced concrete bridges = $4.5/(6+L)$ (where L is the length in meter of span). The bridge is designed
- (i) for spans up to 30 m
 - (ii) for spans between 3 m and 45 m
 - (iii) for spans between 45 m and 90 m
 - (iv) All of the above
- (f) What is the correct sequence in the ascending order of the span ranges generally adopted?
- (i) 2-4-1-3
 - (ii) 1-3-2-4
 - (iii) 2-3-1-4
 - (iv) 1-4-2-3
- (g) Minimum percentages of reinforcement provided in water tank is
- (i) 0.24%
 - (ii) 0.1%
 - (iii) 0.4%
 - (iv) 0.12%

(Turn Over)

- (h) As per Janssen's theory of silos
- (i) large fraction of weight of contained material is supported by friction between material and wall
 - (ii) large fraction of weight is supported by hopper bottom
 - (iii) Rankine lateral pressure theory can be applied directly
 - (iv) the vertical wall of silo are subjective to lateral pressure only
- (i) On which of the following concepts is basic principle of structural design based?
- (i) Weak column and strong beam
 - (ii) Strong column and weak beam
 - (iii) Equally strong column-beam
 - (iv) Partial weak column beam
- (j) For bridge deck, the most economical section is
- (i) a double T-section
 - (ii) an I-section
 - (iii) a box section
 - (iv) a channel section

(5)

(6)

2. (a) Explain the effect of continuity in the design of top spherical dome and cylindrical wall of an Intze tank. 7
- (b) Explain the site selection criterion of design of bridge. 7
3. Obtain the geometrical dimension of container of an Intze tank for 700kL capacity. Also design conical dome and bottom circular dome of the tank. Use M30 grade concrete and Fe 500 HYSD steel. 14
4. Design a solid slab bridge for class A loading for the following data : 14
- Clear span = 5 m
Clear width of roadways = 7.5 m
Thickness of wearing coat = 80 mm
Use M25 mix. Take unit weight of concrete as 24 kN/m^3 .
5. A concrete circular cylinder silo having a ratio of height (cylindrical portion) to the diameter is 4, is required to store 2000 kN of wheat having density of 8.0 kN/m^3 . The coefficient of friction between grain and concrete is 0.444 and the ratio of horizontal to vertical pressure is 0.4. The angle of repose is 25° . Design the reinforcement in the circular walls and the conical hopper bottom. Use M25 grade concrete and Fe500 HYSD. 14

6. Design a box culvert having inside dimensions $3.5 \text{ m} \times 3.5 \text{ m}$. The box culvert is subjected to a superimposed load of 12000 N/m^2 and a live load of 45000 N/m^2 from the top. Assume unit weight of soil as 18000 N/m^3 and angle of repose of 30° . Use M20 concrete and Fe 415 steel. 14
7. The plan size of a residential building is $15 \text{ m} \times 5 \text{ m}$. A framed building of three-story height is 4 m. First floor weight is 3800 kN, second floor weight is 3000 kN, and third floor weight is 2500 kN. The building is in seismic zone-IV of medium soil. The frame is ordinary moment resisting frame. Determine the lateral seismic force distribution at each floor level along the shorter as well as longer plan dimensions of the frames. 14
8. A continuous beam of three spans each of 6 m effective length having superimposed load is 20 kN/m^2 excluding self-weight. The width and overall depths are 300 mm and 800 mm. Use limit state designing method using IS-456 : 2000. Design the reinforcement of BM and shear force. 14

9. Explain various parts given below : 14

- (a) Bearing in bridge
- (b) Deck in bridge
- (c) Braces
- (d) Sub-structure and super-structure
