

B.TECH.
(SEM VI) THEORY EXAMINATION 2018-19
DESIGN OF STRUCTURE-II

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If you require any missing data, choose suitably.
 2. Use of IS 456; 2000 is permitted.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

- a. Find the depth of neutral axis and lever arm for a balanced section of a singly reinforced beam using M20 and Plain steel by WSM.
- b. Draw the strain diagram of a singly reinforced beam for LSM.
- c. Give two examples of structures subjected to torsional moments.
- d. Why helical reinforcement better than lateral ties in circular column?
- e. What is the difference between Main bars and distribution bars in slab?
- f. Draw the diagram of Counterfort retaining wall.
- g. What are the uses of shear key in retaining wall?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

- a. Find the moment of resistance of an R.C.C. cantilever beam of 300mm width and 500 mm effective depth, reinforced with 2 bars of 16 mm diameter. Use M20 concrete and Fe415 steel. Also find the safe load, including its self weight, if the span of the beam is 2 m. Use Working Stress Method and design.
- b. Write the steps for design of shear reinforcement for a beam.
- c. Find the reinforcement for a lintel for a window opening of 2.1 m wide. The window is centrally located in a 300mm thick brick wall, the height of the masonry above the lintel 3m. Use M20 concrete and Fe415 steel. Unit weight of masonry = 19 kN/m³.
- d. Write the functions of Longitudinal reinforcement and transverse reinforcement for column.
- e. A brick masonry wall 230 mm thick carries a load of 370 kN/m inclusive of its own weight. The bearing capacity of soil is 151 kN/m² at 1 m depth. Design the footing of the wall. Use M20 concrete and Fe415 steel.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

- (a) Write design steps of Doubly reinforced beam by WSM. The Span of the beam is l , size of beam ($b \times d$), loading on the beam and grade of concrete and steel are known.
- (b) A rectangular reinforced concrete beam is simply supported on two masonry wall 230 mm thick and 6 m span center to center. The beam is carrying an imposed load of 15 kN/m. Design the beam and check only for deflection. Use M25 concrete and Fe415 steel. Take effective cover 50 mm.

4. Attempt any *one* part of the following: 7 x 1 = 7

- (a) A rectangular simply supported beam 300mm x 500 mm spanning over 5 m is

subjected to a maximum moment of 150 kNm at the mid span . The beam is reinforced with four bars of 25 mm diameter, on the tension side at an effective depth of 450 mm . The bars are spaced at 50 mm centre to centre . Check the beam for serviceability limit state of cracking . If M20 and Fe415 steel is used.

- (b) Design a cantilever slab for chajja of an overhang 1.1 m . The imposed load on slab is 1 kN/m² and weight of finishing is 0.8kN/m². Use M20 concrete and Fe415 steel. Also check for shear.

5. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Design a column of size 450mm x 600mm and having 3 m unsupported length. The column is subjected to a ultimate load of 3000kN and is effectively held in position but not restrained against rotation. Use M20 concrete and Fe415 steel. Draw the sketch also.
- (b) Write the design steps for Isolated square footing of a column.

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Draw the structural behavior of a combined footing with L-section , Plan and section at column.
- (b) Design a combined footing for two columns 500mm x500mm each , 5 m apart center to center of column carrying a load of 1600 kN each. The width restriction is 2.4 m. The safe bearing capacity is 200 kN/m² . Use M25 concrete and Fe415 steel. Check depth for B.M. Criteria, and one way shear criteria.

7. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Draw the diagram of cantilever retaining wall and show the forces acting on the wall. Also draw reinforcement details in Stem, Heel Slab, and Toe Slab.
- (b) Design a Cantilever retaining wall to retain earth embankment 4.2 m high above G.L. The density of earth is 18kN/m² and angle of repose is 30°. The embankment is horizontal at its top. The safe bearing capacity of the soil is 190kN/m² and the coefficient of friction between soil and concrete is 0.5. Adopt M20 grade concrete and Fe415 grade steel.