

**B.TECH**  
**(SEM VI) THEORY EXAMINATION 2022-23**  
**DESIGN OF CONCRETE STRUCTURES**

Time: 3 Hours

Total Marks: 100

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

**SECTION A**

1. Attempt all questions in brief.

2 x 10 = 20

- (a) Define lever arm and development length.
- (b) Differentiate between under and over reinforced section.
- (c) Why shear reinforcement is provided in beam?
- (d) Classify the different types of bond used in RCC design.
- (e) Enlist the main functions of longitudinal reinforcement.
- (f) Enlist the factors affecting the short-term deflection.
- (g) What is the assumption for limit state of collapse in compression?
- (h) Classify the columns on the basis of different criteria.
- (i) What are the modes of failure of a retaining wall.
- (j) Classify the different types of footing.

**SECTION B**

2. Attempt any three of the following:

10x3=30

- (a) Explain the different philosophies used in design of concrete structures.
- (b) Determine the reinforcement required for a beam of size 300\*600 mm subjected to a factored bending moment of 150 KNm, factored shear force of 100 KN and factored torsional moment of 50 KNm. Use M20 concrete and Fe 415 steel.
- (c) Write the design procedure of two way slab by LSM.
- (d) Design a column of size 450mm\* 600mm and having 3m unsupported length. The column is subjected to a load of 2000 KN and is effectively held in position but not restrained against rotation. Use M 20 concrete and Fe 415 steel.
- (e) Explain with neat sketches various types of retaining wall and situations where a particular type is used.

**SECTION C**

3. Attempt any one part of the following:

10x1=10

- (a) Design a reinforced rectangular beam by Limit State Method to resist a bending moment of 200KN-m. The width of the beam is to be kept as 450mm. Use M 20 concrete and Fe 415 grade of steel.
- (b) Design a reinforced concrete beam by LSM supported on two walls 500 mm thick, spaced at a clear distance of 6 meter. The beam carries a load of 30 KN/m. The size of the beam is restricted to 300mm\*500mm. Use M20 and Fe 415 materials. Assume effective cover as 30mm.

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

**10x1=10**

- (a) A simply supported reinforced concrete beam is 250 mm wide and 500 mm effective depth and is reinforced with 4 bars of 20mm diameter as tensile steel. If the beam is subjected to a factored shear of 95 KN at the support. Design the shear reinforcement consisting of stirrups. Use M20 concrete and Fe415 steel.
- (b) A simply supported beam 300mm\*600mm (effective) is reinforced with 5 bars of 25 mm diameter. It carries a uniformly distributed load of 80 KN/m (including its own weight) over an effective span of 6m. Design the shear reinforcement for the beam. Use M20 grade of concrete and Fe 415 steel.

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

**10x1=10**

- (a) Design a simply supported roof slab for a room 7.5x 3.5m clear in size. The slab is carrying an imposed load of 5 KN/m<sup>2</sup>. Use M 20 mix and Fe415 steel. Take bearing width 200mm.
- (b) Design a reinforced concrete slab for a room of clear dimensions 4m x 5m. The slab is supported on walls of width 300mm. The slab is carrying a live load of 4 KN/m<sup>2</sup> and floor finish 1 KN/m<sup>2</sup>. Use M 20 concrete and Fe415 steel. The corners of slab are held down.

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

**10x1=10**

- (a) An R.C.C. short column of size 400mm x 500mm is carrying a factored load of 3000 KN. Design the column assuming  $e_{min} < 0.005 D$ . Use M 25 concrete and Fe 415 steel.
- (b) Design a circular column of diameter 400mm subjected to a load of 1200 KN. The column is having a spiral ties. The column is 3 m long and is effectively held in position at both ends but not restrained against rotation. Use M 25 concrete and Fe 415 steel.

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

**10x1=10**

- (a) Design the stem of a reinforced concrete cantilever retaining wall, retaining leveled earth 5 m above base slab. Take the density of earth as 18 KN/ m<sup>3</sup> and angle of repose 30°. Toe projection 1.8 m, heel projection 1.7m and thickness of base slab as 450mm. Use M20 concrete and Fe415 steel.
- (b) Find the depth of square footing by Punching shear and find the reinforcement for an axially loaded column of 450mm x 450mm size. The safe bearing capacity of soil is 190KN/m<sup>2</sup>. Load on column is 850KN. Use M 20 concrete and Fe 415 steel. Draw neat sketch.