

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 7.5× 3.5m clear in size. The slab is carrying an imposed load of 5 KN/m². Use M 20 mix and Fe415 steel. Take bearing width 200mm.
 - (b) Design a reinforced concrete slab for a room of clear dimensions 4m×5m. The slab is supported on walls of width 300mm. The slab is carrying a live load of 4 KN/m² and floor finish 1 KN/m². 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×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/m³ 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× 450mm size. The safe bearing capacity of soil is 190KN/m². Load on column is 850KN. Use M 20 concrete and Fe 415 steel. Draw neat sketch.