

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.