

October 2023

Time - Three hours
(Maximum Marks: 100)

- [N.B. 1. Answer all questions under Part-A. Each question carries 3 marks.
2. Answer all the questions either (A) or (B) in Part-B. Each question carries 14 marks.]

PART - A

1. Define effective depth of beam.
2. State the assumptions made in the working stress method of design.
3. State effective span for a cantilever beam and simply supported beam.
4. What is the necessity of providing shear reinforcement?
5. State imposed load for floor slab of a school building and a residential building.
6. How torsion reinforcement is provided for a two-way slab?
7. Write the minimum area and maximum area of longitudinal bar in a RCC column.
8. Write the procedure for checking punching shear for an isolated footing.
9. State the maximum effective slenderness ratio for steel members.
10. Write the formula for finding design strength of fillet welds.

[Turn over.....]

PART - B

11. (a) Find the moment of resistance of a beam 250 mm wide and 500 mm deep overall and reinforced with 2 Nos. of 16 mm dia. bars in compression zone and 4 Nos. of 20 mm dia. bars in tension zone with an effective cover of 40 mm. Use M20 grade of concrete and Fe 415 steel. Use limit state method.

(Or)

- (b) A reinforced concrete beam is supported on two walls 500 mm thick, spaced at a clear distance of 6 m. The beam carries a superimposed load of 9.8 kN/m. Design the beam using M20 concrete mix and Fe 415 steel.

12. (a) A rectangular R.C. verandah beam of size 230mm x 450mm (overall) is continuous over a number of equal spans. It carries a dead load of 15kN/m (including its self weight) and an imposed load of 9kN/m. The clear distance between supporting masonry column is 6m. Size of column is 230mm x 230mm. Design the required reinforcements for the interior support sections using M20 grade concrete and Fe 415 grade steel.

(Or)

- (b) A doubly reinforced rectangular cantilever beam is subjected to a design shear of 250 kN. The breadth and effective depth of the beam are 305 mm and 610 mm, which are uniform throughout. The tension zone is reinforced with 5 nos. of 25 mm dia bars and concrete grade is M25. Determine the spacing of 8mm dia 2 legged stirrups of Fe 415 grade steel required near the support section.

13. (a) Design a R.C slab simply supported on masonry walls 3.8m apart with 300mm thick walls. It carries an imposed load (not fixed) of 5 kN/m² and a floor finish load of 0.5 kN/m². Use M20 grade concrete and Fe 415 steel.

(Or)

- (b) Design the end panel of continuous slab having a clear span of 3.3m. Width of supports is 250mm. The slab is simply supported at the discontinuous end. It is carrying an imposed load of 2 kN/m^2 . The weight of floor finish is 1 kN/m^2 . Use M20 grade concrete and Fe415 reinforcement.

14. (a) Design a short circular column with circular rings using concrete grade M20 and steel grade Fe 415 to carry an axial load of 700kN. The effective length of the column is 3.5m. Mild steel bars may be used for traverse reinforcement. Ignore minimum eccentricity.

(Or)

- (b) Design a sloped square R.C footing for a square R.C. Column of 400mm size, using M20 grade concrete and mild steel reinforcement. The column transmits an axial load of 1000 kN. The bearing capacity of the soil is 200 kN/m^2 .

15. (a) Determine the tensile strength of a roof truss member 2 ISA 100 x 90 x 6 mm connected to the gusset plate of 8 mm plate by 4 mm weld. The effective length of weld is 200 mm.

(Or)

- (b) Determine the design bending strength of ISJC 200 @ 13.9 kg/m when used as a laterally restrained simply supported beam with its major axis as the axis of bending. Take $f_y = 300 \text{ MPa}$.
