

Total No. of Questions : 8]

SEAT No. :

P1337

[Total No. of Pages : 3

[5157] -4002
S. Y. B. Arch. (End Semester)
THEORY OF STRUCTURES - IV
(2015 Pattern)

Time : 3 Hours]

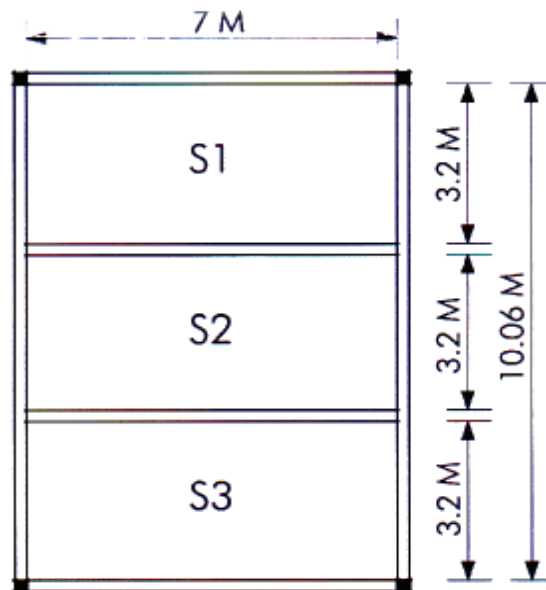
[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.nos. 1 & 5 are compulsory. Solve any two questions from 2, 3 & 4 and two questions from 6, 7 & 8.*
- 2) *Take M20 grade concrete & Fe500 grade steel.*
- 3) *Assume suitable data, if required. Mention the assumption.*
- 4) *Use of Non-Programmable Scientific calculator is allowed.*

SECTION - I

Q1) W.r.t. the framing plan in the figure below, design the slab S1. Assume all beams as 230 mm thk. Take floor finish load = 1.25kN/m² & live load = 4kN/m² Summarize the design by schedule & sketch. **[15]**



Q2) A simply supported RCC beam of size 230×600, M20 grade concrete, is reinforced with 3 nos. 16 Φ Fe500 bars in the tensile zone. Determine,
a) Moment of resistance of the beam.
b) The safe UDL, the beam can carry for an effective simply supported span of 4.43m. **[10]**

P.T.O

Q3) Design a short RCC rectangular column 300 wide, to take a load of 1100 kN. Take 1.5% steel. Make the Schedule & sketch. [10]

Q4) Answer the following [10]

- a) Short note on bond stress & development length.
- b) Terminology in a typical RCC flexural section.
- c) IS 456 provisions for minimum reinforcement in beams and slabs.

SECTION - II

Q5) W.r.t. the framing plan & section in the figure below, design the highlighted beam B1. Assume all slabs to be 130 mm thk. Take floor finish load & live load on slabs as 1.25 kN/m² and 4kN/m², respectively. Take the beam & columns as 230 mm thk. Take density of brick masonry as 19 kN/m³. [15]

Also design the shear stirrups. Refer the Table 19 below as per IS 456 for the same. Summarize the design by Schedule & sketches.

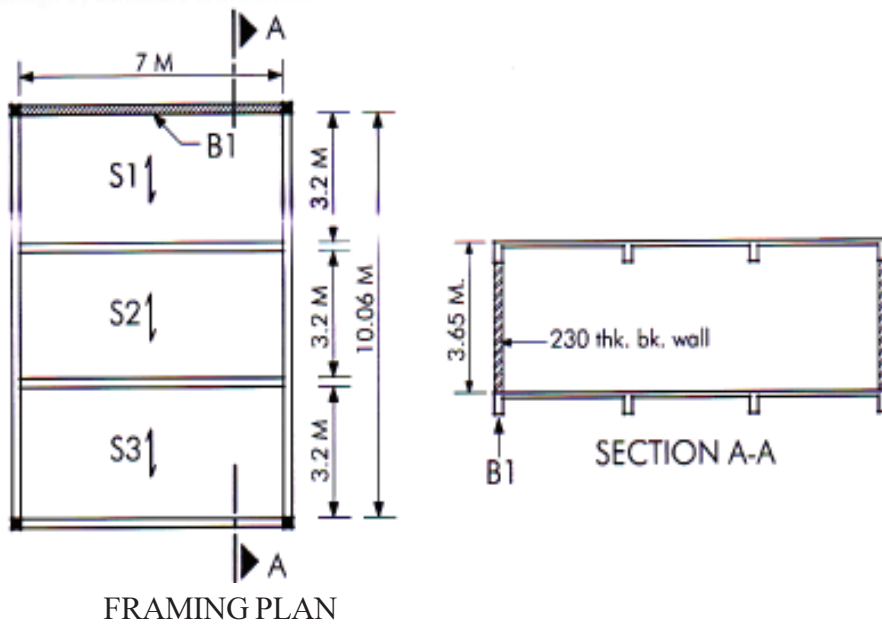


Table 19: Design Shear strength of Concrete

| 100 As / bd (%) | τ_c (N/mm ²) |
|-----------------|-------------------------------|
| 0.15 | 0.28 |
| 0.25 | 0.36 |
| 0.50 | 0.48 |
| 0.75 | 0.56 |
| 1.00 | 0.62 |
| 1.25 | 0.67 |
| 1.50 | 0.72 |

Q6) Design a cantilever balcony slab 1.2 m. wide for a bungalow. Take the beam as 230 thk. Take live load for the balcony = 3 kN/m². Conclude with Schedule & sketch. **[10]**

OR

Draw proportionately, a plan & section as per the following schedule. Show all dimensions and nomenclature. Given-Slab dimensions - 7.5m × 4.0m, Beam widths -250 mm.

| Slab | Depth | Steel @ shorter span | Steel @ longer span | Remark |
|------|-------|----------------------|---------------------|-----------|
| S4 | 160 | 10 Φ @110 c/c | 8 Φ @260 c/c | 1way slab |

Q7) Answer any 3 of the following. **[10]**

- a) Explain limit state of deflection and how is it taken care of.
- b) Explain compressive strength & characteristic strength of concrete.
- c) Explain Limit state of cracking and how is it taken care of .
- d) Explain Under-reinforced & over-reinforced sections.

Q8) Design a timber beam in Indian Oak to take a load of 25kN/m inclusive of its own weight for a simply supported clear span of 4.5 m. The beam is supported on 230 thk. bk. walls. Take $d = 3b$, Permissible bending stress -12.16 N/mm², Permissible shear stress - 1.67 N/mm², Check for shear only. Check for deflection and form factor not required. **[10]**

