P268

[5257]-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.   **[15]**
Assume all beams as 230 mm thk. Take floor finish load = 1.25 kN/m² & live load = 4 kN/m².

Summarize the design by Schedule & Sketch.
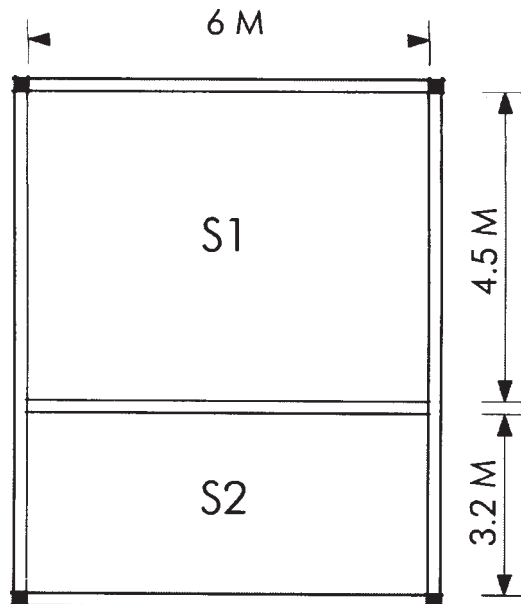
Q2) A simply supported RCC beam of size 230 × 450, M20 grade concrete, is reinforced with 2 nos. 20 ϕ Fe500 bars in the tensile zone. Determine, **[10]**

   a) Moment of resistance of the beam.

   b) The safe UDL, the beam can carry for an effective simply supported span of 4.10 m.

Q3) Design a short RCC rectangular column 230 wide, to take a load of 650 kN. Take 1% steel. Make the Schedule & sketch. **[10]**

Q4) Answer the following : **[10]**

   a) IS 456 provisions of minimum reinforcement in slabs and beams.

   b) Short note on bond stress & development length.

   c) Explain with sketches the function of distribution steel in 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 4 kN/m², respectively. Take the beam & columns as 230 mm thk. Take density of brick masonry as 19 kN/m³.

Also design the shear stirrups. Refer the Table 19 below as per IS 456 for the same. Summarize the design by Schedule & Sketches. **[15]**

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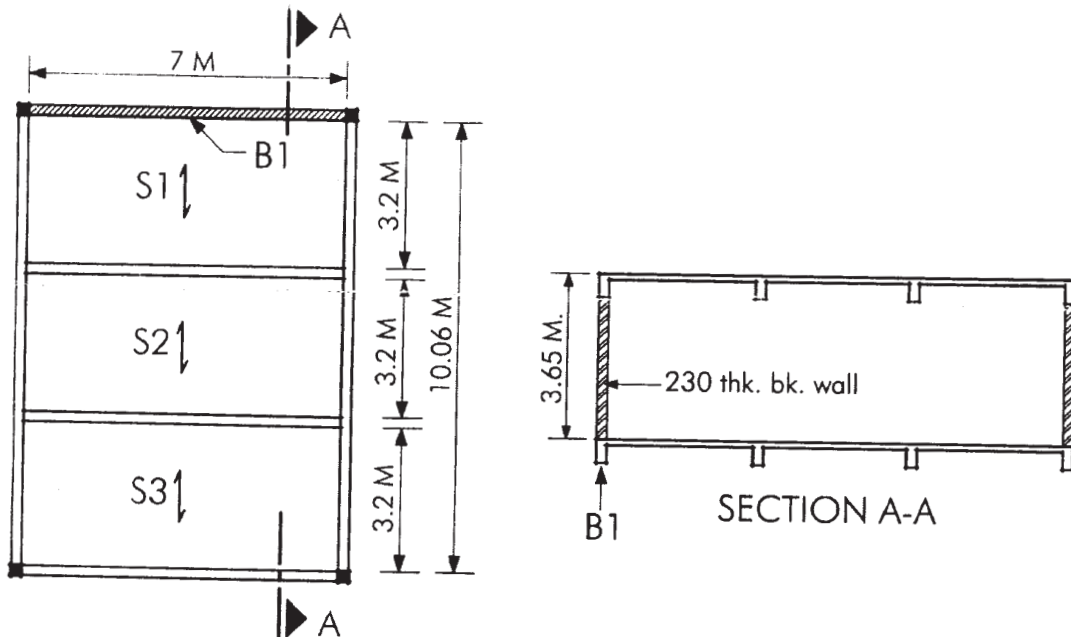
FRAMING PLAN

Table 19: Design Shear strength of Concrete

100 As/bd (%)	τc (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 1.25 m. wide for a bungalow. Take the beam as 230 thk. **[10]**

Take live load for the balcony = 3 kN/m^2. Conclude with Schedule & sketch.

OR

Draw proportionately, a plan & section as per the following schedule. Show all dimensions and nomenclature. Given - Slab dimensions - 7.5 m × 3.6 m, Beam widths - 230 mm

Slab	Depth	Steel @ shorter span	Steel @ longer span	Remark
S4	145	10 Φ @ 125 c/c	8 Φ @ 285 c/c	1 way slab

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

a) Explain Under-reinforced & over-reinforced sections.

b) Explain compressive strength & characteristic strength of concrete.

c) Explain Limit state of cracking and how is it taken care of.

d) Explain Limit state of deflection and how is it taken care of.

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Q8) Design a timber beam in Indian Oak to take a load of 27 kN/m inclusive of its own weight for a simply supported clear span of 4.6 m. The beam is supported on 230 thk. bk. walls. **[10]**

Take d = 3b, Permissible bending stress - 12.16 N/mm^2, Permissible shear stress - 1.67 N/mm^2, Check for shear only. Check for deflection and form factor not required.

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