



**Fifth Semester B.E. Degree Examination, June/July 2016**  
**Design of RCC Structural Elements**

\*Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.  
 2. Use of IS 456-2000 and SP-16 is permitted.  
 3. Assume missing data suitably.

**PART – A**

- 1 a. Briefly explain under reinforced, over reinforced and balanced sections with sketches. (06 Marks)
- b. Explain the following :
  - i) Partial safety factors for loads and materials
  - ii) Characteristic load
  - iii) Characteristic strength. (09 Marks)
- c. Clearly distinguish between working stress method and limit state method of design of R.C sections. (05 Marks)
- 2 a. Define Doubly reinforced beam. List the situations which require the adoption of a Doubly reinforced beam. (06 Marks)
- b. A concrete beam has 350mm breadth and 700mm effective depth. Determine the total area of steel required if a beam is subjected to factored bending moment of 600kN m. Use M20 concrete and Fe 415 grade steel. Take  $d^1 = 50\text{mm}$ . Design stress strain curve data for Fe415 steel are given below (14 Marks)
 

Strain	Stress (N/mm <sup>2</sup> )
0.00276	351.8
0.00380	360.9
- 3 a. Discuss in brief short and long term deflections of R.C Beams. (06 Marks)
- b. A reinforced concrete beam of cross section 300mm×600mm overall is reinforced with 3 bars of 20mm diameter HYSD of Fe415 grade on tension side with an effective cover of 50mm. Compute short term deflection at midspan consisting of service load of 20kN/m and concentrated load of 25kN at the centre of span. The beam is simply supported over a span of 5m. Use M20 grade concrete and Fe415 steel. (14 Marks)
- 4 A Hall measuring 14m × 6m, beams are spaced at 3.5m c/c. The thickness of wall being 300mm. The thickness of slab is 150mm. Live load of slab is 5kN/m<sup>2</sup>. The web (rib) width of beam is taken as 300mm. Design an intermediate T – beam. Use M15 concrete and Fe415 steel. Take  $d = 500\text{mm}$ ,  $d^1 = 50\text{mm}$ . Sketch the reinforcement details. (20 Marks)

**PART – B**

- 5 Design a one way slab with a clear span of inner distance 3.5m × 8m simply supported over an 230mm thick supporting wall to support a live load of 4kN/m<sup>2</sup>. Adopt M20 grade concrete and Fe 415 steel Take  $\ell/d = 25$  and  $d^1 = 20\text{mm}$ . (20 Marks)

- 6 a. Explain the design steps for axially loaded short columns. (06 Marks)
- b. Design a short R.C column of rectangular section subjected to ultimate load of 600kN and ultimate bending moment of 100 kN.m. The column bends at major axis (x-axis). The effective length of column is 4.5m. Assume width of column as 300mm. Use M<sub>20</sub> grade concrete and Fe415 steel. Design the lateral ties and sketch the details. Take D = 450mm and d' = 45mm. (14 Marks)
- 7 A square footing has to transfer a load of 1000kN from square column of size 400mm × 400mm. Assume M20 grade concrete and Fe415 HYSD steel Bars. Take SBC of soil = 200kN/m<sup>2</sup>. Design the footing and sketch the reinforcement details. (20 Marks)
- 8 Design a dog legged stairs for an office building in a room measuring 2.8m × 5.8m clear. Vertical distance between the floors is 3.6m. Width of flight is to be 1.25m. Allowable live load is 3kN/m<sup>2</sup>. Sketch the details of reinforcements. Use M20 concrete and Fe415 steel. Assume the stairs are supported on 230mm walls at the ends of outer edges of landing slabs. Take riser = 150mm and Tread = 300mm. (20 Marks)

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