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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, M. Tech. - Civil Engineering (MCAD)

Semester End Examination; Dec - 2016/Jan - 2017

Advanced Design of Reinforced Concrete Structural Elements

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FOUR** full questions, choosing at least **ONE** full question from each unit.*
ii) Use of IS 456 and SP 16 are permitted.
iii) Assume missing data if any.

UNIT - I

1. Design a rectangular continuous beam over spans 7 m to carry a dead load 12 kN/m and a live load of 16 kN/m. The beam is continuous over more than 3 spans and is supported by columns. Use M20 concrete and Fe415 steel. 25

2. A continuous beam with simple supports has two spans each of 6 m, from c/c of supports. The characteristic dead load of 15 kN/m and characteristic live load is 20 kN/m. Design the critical section of the beam and sketch the details of reinforcement. Use M20 concrete Fe500 Steel. 25

UNIT - II

3. Design an interior panel of a flat slab with panel size 6 m x 6 m supported by columns of size 500 mm x 500 mm. Provide suitable drop, take live load as 4 kN/m^2. Use M20 concrete and Fe415 steel. Sketch details of reinforcement. 25

4. Design a fixed circular slab of a water tank to suit the following data,
   Slab is fixed to circular ring beam, Depth of water in the tank = 5 m
   Diameter of tank (c/c of circular beam) = 8 m
   Use M20 Grade concrete and Fe415 Steel. 25

UNIT - III

5. The roof of an 8 m wide hall is supported on portal frame spaced at 4 m intervals. The height of the portal frame is 4 m. The continuous slab is 120 mm thick. LL on roof is 1.5 kN/m^2. SBC of soil is 150 kN/m^2. The column may be assumed as fixed. Design the column and beam members of the portal frame. Use M20 concrete and Fe415 steel, sketch the details of reinforcement. 25

6. Design a slender column with biaxial bending from the following data. Use M30 Grade concrete and Fe415 steel Size of column = 6 m.
   L_{ex} = 6 m (Effective length for bending Parallel to larger dimension)
   L_{ey} = 5 m (Shorter dimension). 25
   Un supported length = 7.0 m, Factored load; P_u = 1500 kN
   Factored moment in the direction of larger dimension = 40 kN-m (TOP) and 22.5 kN-m (bottom)
   Factored moment in the direction of shorter dimension = 30 kN-m (Top) 20 kN-m (bottom).

Contd….2

UNIT - IV

7. Design the side walls and hopper bottom of a 3 m x 3 m square bunker to store 300 kN of a coal. Density of coal is 9 kN/m^3. Angle of repose = 30 degrees. Adopt M20 grade concrete and Fe415 steel. Sketch the details of reinforcement in the bunker. 25

8. A cylindrical silo having an internal diameter of 6 m and 20 m deep (cylindrical portion) with a conical hopper bottom. The material stored is wheat with density of 8 kN/m^3. The co-efficient of friction between wall and material is 0.444. The ratio of horizontal to vertical pressure is 0.40. Angle to repose = 25 degrees. Adopt M20 grade concrete and Fe415 steel. Adopt Janssen's theory for pressure calculations. Sketch details of reinforcement. 25

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