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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; Dec - 2017/Jan - 2018

Advanced Design of RC Structural Elements

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FOUR** full questions, selecting **ONE** full question from each unit.*
*ii) Use of **IS456** and **SP16** are permitted. iii) Assume missing data if any.*

UNIT - I

1. A continuous beam of a multi-storey frame has spans of each of 8 m. The characteristic dead load is 10 kN/m and live load is 15 kN/m. Design the critical sections of the beam and sketch the details of reinforcements. Use M20 grade concrete and Fe415 steel. 25

2. Design a continuous beam of two spans supported on BB masonry walls using the limit method and allowing for 15% redistribution of moments. The following data may be used.
   Data :
   Clear span between supports = 6 m
   Width of masonry supports = 330 mm
   Depth of RC slab = 150 mm
   Spacing of continuous beams = 3 m c/c
   Self weight of floor finish = 0.4 kN/m^2
   Live load on floor = 4 kN/m^2
   Use M20 concrete, Fe415steel. 25

UNIT - II

3. Design an interior panel of a flat slab of size 5 m x 5 m without providing drop and column head size of columns is 500 x 500 mm and live load on the panel is 4 kN/m^2. Take floor finishing load as 1 kN/m^2. Use M20 concrete and Fe415 steel. Sketch reinforcement details. 25

4. A circular slab of diameter 6 m is subjected to a super imposed load of 4 kN/m^2. It may be considered as simply supported. Using M20 concrete and Fe415 steel design the slab and sketch the details of reinforcement. 25

UNIT - III

5. The roof of 8 m wide hall is supported on a portal frame. Space data 3.5 mc/c. The height of a portal frame is 3.6 m. The continuous slab is 120 mm thick. The slab is loaded with live load of 1.5 kN/m^2 and F.F. is 0.75 kN/m^2. Base of the column are fixed. SBC of soil is 200 kN/m^2. Design the portal frame (Beams and columns only) and sketch reinforcement details. Use M30 grade concrete and Fe415 steel. 25

Contd…2

6. A RC braced column 300 mm x 400 mm is subjected to P_u = 1500 kN and ultimate moments M_y = 60 kN-m at top and M_y = 8 kN-m at the bottom. If the column is bent in double curvature, about minor axis (*y*-axis) determine the design moments. Take unsupported length equal to 8 m and effective length as 6 m about both the axes. Assume K_a = 1. 25

UNIT - IV

7. Design the side walls and hopper bottom of a rectangular bunker of capacity 300 kN to store coal using M20 concrete and Fe415 steel. Density of coal is 8 kN/m^3. Angle of repose of Coal = 25 degrees. Sketch the details of reinforcement. Coefficient of friction between coal and concrete = $\mu' = 0.444$. 25

8. A silo with internal diameter 5.5 m height of cylindrical portion 18 m and central opening with 0.5 m is to be built to store wheat. Design the silo using M20 grade concrete and Fe415 steel. The following data may be used :

   Unit weight of wheat = 8.5 kN/m^3

   Angle of internal friction = 28º

   Angle of wall friction = 0.75 ϕ while filling

   = 0.60 ϕ while emptying

   Pressure ratio = $\frac{P_h}{P_v}$ = K = 0.5 while filling

   Use Janesen's theory for pressure calculations. 25

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