Roll No…….. **Total No. of Printed Pages: 2**

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B. Tech Civil (Semester – 7th)
DESIGN OF CONCRETE STRUCTURES - II
Subject Code: BCIES1701
Paper ID: 18110753

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) What is meant by equivalent length of a column?
b) Span/depth ratio can be used to control deflection in beams, Justify.
c) What are the codal recommendations of torsion steel in curved beams?
d) Describe at least two functions of a shear key.
e) What is the difference between lap length and anchorage length?
f) Interaction diagrams are convex outwards. Explain.
g) What are the assumptions in design of mat footing?
h) With the aid of sketch, show the behaviour of vertical wall & heel slab, in case of counterfort retaining wall.
i) List the loads you will account for design of Domes.
j) Explain Load cases for design of underground water tanks.

Section – B **(5 marks each)**

Q2. A rectangular column of effective height 4m is subjected to a character stick axial load of 800kN and a bending moment of l00kNm about the major axis of the column. Design a suitable section for the-column so that the width should not exceed 400mm. Assume f_{ck} = 25 and f_y=415. Draw the reinforcement details.

Q3. Design an isolated footing for a square column 400mm x 400mm with 12-20mm diameter longitudinal bars carrying service loads of 1500 kN. The safe bearing capacity of soil is 200kN/m^2 at a depth of 1.5m below the ground level. Use M20 grade of concrete and Fe 415 steel. Sketch the details of reinforcement.

Q4. A continuous reinforced concrete rectangular beam of size 300×600 mm is subjected to an elastic factored moment of 300kNm at an interior support. The beam is provided with 4-16mm reinforcement at bottom over the support with a nominal cover of 30mm. If the

moment redistribution is limited to 30%, calculate the tension steel required to carry the moment. Use M20 grade of concrete and Fe415 grade of steel.

Q5. A rectangular water tank 5m wide, 10m long and 4m deep has its walls rigidly connected (jointed) with base slab. The free board is required as 300mm. The tank is resting on ground. Design the tank using M30 concrete and Fe 415 steel.

Q6. Design stem of a retaining wall to resist 4.0 m earth weighing 18kN/m^3 with angle of internal friction 28^o. The allowable B.C. of soil is 150kN/m^2 at a depth of 1.0 m below the natural ground. Use M20 grade of concrete and Fe415 grade of steel.

Section – C **(10 marks each)**

Q7. Design a combined footing with a strap beam for two columns of size 300mm x 300mm spaced at 4m c/c and each supporting a service axial load of 500 kN. The safe bearing capacity of soil at site is 150 kN/m^2. Adopt M20 grade of concrete and Fe-415 HYSD bars.

Q8. Design a spherical dome for a hall of 8 m diameter. The rise of dome is 1.75m. The dead weight of lantern is 1.5 kN/m^2 which acts along the circumference of lantern opening of 1.5 m diameter. Live load with finishes may be taken 1.5 kN/m^2. Use M20 grade of concrete and Fe 415 grade of steel.

Q9. Design a semi-circular beam supported on three equally spaced columns. The centres of the columns are on a circular curve 10m diameter. The beam carries a uniformly distributed designed live load of 25 kN/m. Use M 25 grade of concrete and Fe 500 grade of steel.