BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VII CIVIL : WINTER- 2022
SUBJECT : STRUCTURAL DESIGN-III

Day : Wednesday | Time : 02:30 PM-06:30 PM

Date : 07-12-2022 | **W-13620-2022** | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Use of I.S. 456-2000, I.S. 1343-2012, I.S. 3370-2009 and electronic non-programmable **CALCULATOR** is allowed.
5) Your answers will be valued as a whole.
6) Assume suitable data if necessary.

Q.1 **a)** Explain the Hoyer's system of prestressing. **[05]**

b) Name the various concepts used in prestressing and briefly elaborate any one. **[05]**

OR

A prestressed concrete beam supports a live load of 4kN/m over a simply supported span of 8m. The beam is an I – section with an overall depth of 400mm. The thickness of the flange and web are 100mm and 120mm respectively. The width of flange is 350mm. The beam is prestressed by an effective prestressing force of 240 kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at the centre of the span is zero. Find the eccentricity required for the force. **[10]**

Q.2 **a)** What are the various losses induced in a prestressed concrete beam? Out of these losses, categories these losses as applicable to pretensioned and to post tensioned beams? **[04]**

b) A P.S.C. beam of 300mm wide and 450mm deep on a simply supported span of 10m is prestressed with steel wires of area 580mm^2 provided at an uniform eccentricity of 90mm. Initial prestress is 1100 N/mm^2. Determine the percentage loss of prestress if the beam is pre-tensioned. **[06]**

Take E_S = 210 kN/mm^2 E_C = 35 kN/mm^2.
Relative humidity = 50%
Relaxation of steel = 2% of initial prestress
Anchorage slip = 1.3mm.
μ = 0.25 k = 0.0015 per m
Ultimate creep strain = 22×10^{-6} per N/mm^2
Grade of concrete = M40
Age of loading = 28 days

OR

Design a post tensioned simply supported girder of an unsymmetrical I – section for a span of 17m subjected to a live load of 10kN/m and dead load of 4kN/m in addition to its self-weight. Assume Loss Ratio = 0.85. Design for flexure only and give the necessary checks. Determination of cable profile not expected. **[10]**

P.T.O.

Q.3 **a)** List the various elements of a flat slab and what are the types of flat slab based on use of these elements. **[04]**

b) Design an interior panel of a flat slab 6.4m × 6.4 m for a live load of 6 kN/m^2. Use M25, F_e 500. **[06]**

OR

Design an exterior panel of a flat slab 6.4m × 6.4 m for a live load of 6 kN/m^2. Use M25, F_e 500. **[10]**

Q.4 **a)** What are the various stability checks to be given in the design of a retaining wall? How they are given? What are the IS code requirements? **[06]**

b) What is a shear key? When and where it is provided? Write the steps in the design of a shear key and show the detailing of reinforcement in a shear key. **[04]**

OR

Decide the dimensions of R.C. a T-shaped cantilever retaining wall subjected to an inclined surcharge with angle of 19^0.
S.B.C. of soil = 210 kN/m^2
Height of soil to be retained = 4.6m
Angle of internal friction = 30^0
Unit weight of soil = 19kN/m^3
Check the dimensions for stability checks and design the stem of the wall.

Q.5 Two columns A and B are spaced 4.6m apart. Distance of property line from the centre line of column A is 0.5m. **[10]**
Size of column A = 380mm × 380mm and carries a load of 1000 kN.
Size of column B = 525mm × 525mm and carries a load of 1750 kN.
Safe bearing capacity of soil = 220kN/m^2.
Design a slab type combined footing for columns A and B. Use M25, F_e 500.

OR

Design a beam slab type combined footing for the two column A and B for the same data mentioned in Q.5 above. **[10]**

Q.6 **a)** What is the difference between a flexible base and rigid base of a water tank? How it is constructed on site? **[04]**

b) Design a circular water tank resting on ground of capacity 5 lakh litres. **[06]**
Depth of water = 3.2m with a free board of 200mm.
Use IS code method and rigid joint between the base and the wall. Use M30, F_e 250.

OR

Design a rectangular tank of size 4m × 3m × 2.5m using IS code method. Use M20, F_e 415. The tank is resting on ground. **[10]**

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