H.T.No. | | | | | | | | | | |

Code No: CE1915 **GEC-R14**

M. Tech II Semester Regular/Suppl. Examinations, July 2017

PRE-STRESSED CONCRETE

(Structural Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: Answer any **FIVE** questions. All Questions carry equal Marks.
Assume data suitably, if found necessary. ***IS: 456 and IS: 1343 is allowed.***

5 × 12 = 60M

1. a) Explain about the assumptions made in the design of pre-stressed concrete members. (6M)

   b) Explain about the merits and demerits of pre-stressed concrete construction. (6M)

2. a) Explain about the post - tensioning systems and their limitations. (6M)

   b) Explain about the Freyssinet system of prestressing concrete members with neat sketches. (6M)

3. A simply supported post tensioned beam 300 mm wide and 600 mm deep and span of 10 m is pre-stressed by successive tensioning and anchoring of three cables A, B and C. Cable A is parabolic with an eccentricity of 100 mm above the centroidal axis at support and 100 mm below the centroidal axis at mid span. Cable B is also parabolic with zero eccentricity at the support and 100 mm below the centroidal axis at the centre of the span. Cable C is straight and is kept 100 mm below the centroidal axis. The cables are tensioned one - by- one in the order A, B, and C. Determine the loss in prestress in the cables due to the elastic shortening of concrete for the following data. (12M)

   Cross - sectional area of each cable = 400 mm^2

   Initial stress in pre-stressing steel = 1200 MPa

   Compressive strength of concrete at transfer = 30 MPa

   Modulus of elasticity of pre-stressing steel = 200 GPa

4. A post tensioned girder of 12 m span has a symmetrical I – section with the following data: flanges (750 mm x 200 mm) web (300 mm x 800 mm). It has a parabolic cable line with eccentricities 500 mm, - 200 mm, - 200 mm at mid span and the two ends respectively. At the initial stage, the prestressing force is 3780 kN and the dead load is 17.08 kN /m inclusive of self weight. At the stage, the pre-stressing force reduced to 3240 kN , the live load is 33.08 kN/m. Determine the extreme fiber stresses at the mid span section at the initial and final stages respectively. Draw the stress diagrams for the two stages. (12M)

5. A simply supported post - tensioned rectangular beam of span 10 m has to carry a live load of 10 kN /m. The permissible tensile stresses at transfer and in service condition are 2.5 N/mm^2 and 2 N/mm^2 respectively. The grade of concrete is M 60 with a compressive strength of 40 MPa at the stage of transfer of loading. Determine the appropriate section for the beam. (12M)

6. Determine the required shear reinforcement at the critical section of the prestressed concrete beam shown in the figure below. Assume that the width of column as 500 mm. Take Live load and superimposed dead loads as 10 kN/m and 4 kN/m Characteristic strength of prestressing steel : 1700 MPa, f_{pe} = 1200 MPa f_{ck} = 40 MPa. (12M)

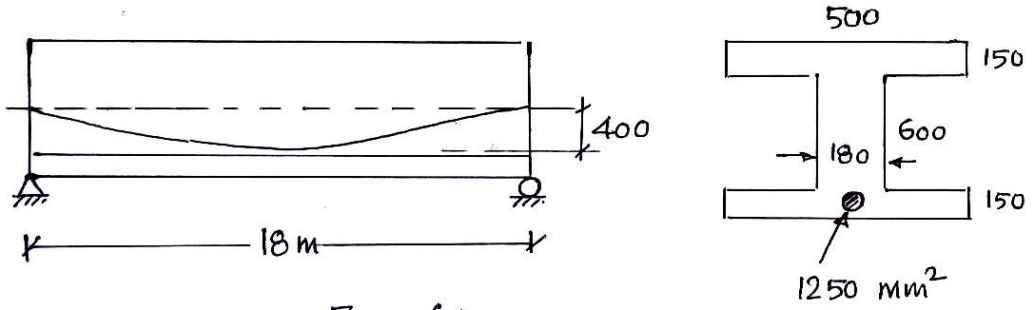

Figure (2)

7. Design a simply supported one - way slab of span 10 m to carry a live load of intensity 6 kN/m^2.Use M 60 grade concrete. Do the checks for flexural stresses, shear capacity and maximum deflection in the slab. (12M)

8. Calculate the primary, secondary and total moments due to pre-stress in the continuous beam shown in the figure below. The beam has a uniform rectangular cross - section of 300 mm x 1000 mm (depth). The effective pre-stressing force is 1800 kN. Also find the extreme fibre stresses at sections 1 and 2 due to the pre-stressing force, self weight and live load of intensity of 8 kN/m (12M)

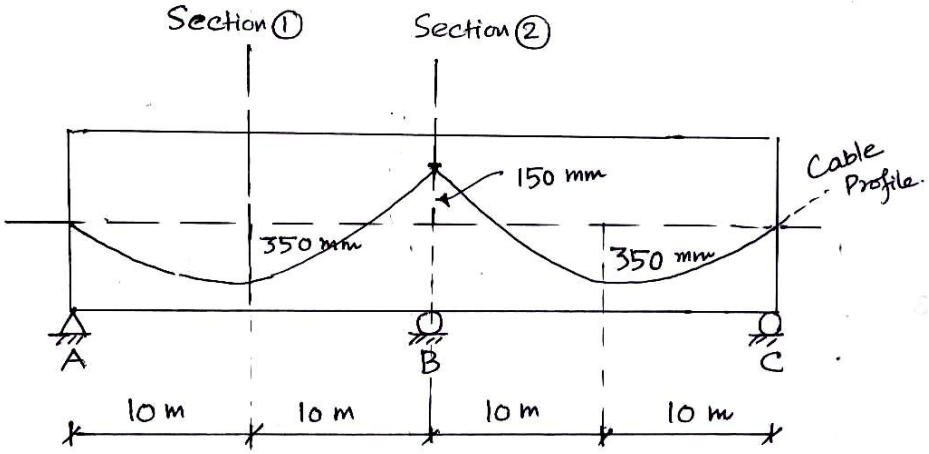

Figure (E)

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