Ref: Ex/Con/T/326/2017

B. Construction Engineering 3rd Year 2nd Semester Examination 2017

PRE-CAST & PRE-STRESSED CONCRETE

Part I

Time : Three hours | Full Marks : 100

Answer **any two** Questions.
Assume any suitable data not provided.
Answer should be explained with neat sketches.

1. (a) What do you mean by Pre-cast Concrete? Discuss the advantage & Limitations. 6

   (b) Critically compare between Reinforced Concrete & Pre-Stressed Concrete from conceptual consideration. 7

   (c) Design a pre-stressed concrete beam of rectangular cross section made of M45 grade over a simple supported span of 25 m. Superimposed uniformly distributed load of 14 KN/m will be subjected on the entire span of the beam. The permissible tensile stresses in concrete and in pre-stressing steel are assumed to be 0 and 1450 MPa. 12

2. (a) Discuss Principle of Pre-stressed concrete from elastic consideration. 7

   (b) A T beam is used to support live load of 35 KN/m over a simple supported span of 27.5 meters. The size of the top flange is 1000 x 300 mm. The overall depth of the pre-stressed beam is 1500 mm. Thickness of the web is 160 mm. Assume density of concrete is 25 KN/m^3. Initial pre-stressing forces each of 1750 KN applied through the 80 mm diameter cable ducts, the centres of which are located at 250 mm and 450 mm above the soffit (bottom) of the beam at mid span. Calculate the stress at transfer and final stages at top and bottom fibres at mid span. Assume total loss of pre-stress of 16% at the final stage. 18

3. a) What do you mean by pressure line concept in pre-stressed concrete? 7

   b) A pre-tensioned simply supported beam of rectangular section 80 mm wide by 120 mm deep is to be designed to support concentrated loads of 4 KN each at one third over an effective span of 3 meter. The permissible stresses in concrete are limited to 0 and 1.4 MPa in tension at transfer stage and final stage respectively. If 12T13 strands are initially stressed to 1400MPa are used, find the number of strands required and their eccentricity. Assume 20% loss in pre-stress at final stage. The density of concrete is 25 KN/M^3. 18

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Sub: Precast & prestressed concrete

PART-II

Answer Question No. 1 & any two from the rest(20+15×2=50)

1. Write the shot note on the following
   a. Pre tensioning and post tensioning Concrete
   b. Anchorage & Axial prestressing
   c. Degree of prestressing & Creep coefficient
   d. Loss of prestressed and different type of lossess

2. A box girder of prestressed concrete of span of 40 m has over all dimensions of 1200 mm by 1800mm. The uniform thickness of the walls is 200 mm. the live load moments is 2000KN m at the centre of the span. the beam is prestressed by parabolic cables with an effective force of 7000KN. The cables which are concentric at supports have an eccentricity of 800 mm at the centre-of span section. Compute the resultant stresses at the centre-of span section using the internal resisting couple method.
3. A rectangular concrete beam of cross section 50cm deep & 200 cm wide is prestressed by means of 18 wires of 5mm dia located 7 cm from the bottom of the beam & 3 wires of diameter of 5mm , 4 cm from the top. Assuming the prestressed in the steel as 900 N/mm^2. Calculate the stresses at the extreme fibres of the mid span section when the beam is supporting its own weight over a span of 8m. take UDL= 8KN/m. density of concrete= $24KN/m^3$
4. A prestressed concrete beam of section 250X 400 mm deep is used over an effective span of 9m to a supported a UDL of 8KN/m, which includes the self-weight of the beam. The beam is prestressed by a straight cable carrying a force of 350 KN. And located at an eccentricity of 50 mm. determine the location of the trust line in the beam and plot its position at quarter and central span sections.
5. A Prestress concrete beam of rectangular section 200 mm wide and 400 mm deep spans over 8m. the beam is prestressed by a straight cable carrying an effective force of 300 KN at an eccentricity of 50 mm. if its supports an imposed load of 6KN/m and the modulus of elasticity of concrete is $38KN/mm^2$, compute the deflection at the following stages and check whether they comply with the IS Code specification.
   a) Upward deflection under (Prestress + self-weight)

b) Final downward deflection under (Prestress+ self-weight + imposed load) including the effects of creep and shrinkage. Assume the creep coefficient to be 1.80