Registration No : | | | | | | | | | | |

Total Number of Pages : 03 **B. Tech.**
PCI6J006

6th Semester Regular Examination 2017-18
PRESTRESSED CONCRETE
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 100
Q.CODE : C423

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions : *multiple type or dash fill up type :*** **(2 x 10)**

a) In a concrete member, trapezoidal cable profile is adopted when the beam is subjected to:
(a) UDL (b) SSB
(c) Point loads (d) Concentrated loads

b) Pre-stressing is economical for members of
(a) long span (b) short span
(c) medium span (d) both (a) and (b)

c) Stress at the bottom edge of a simply supported beam corresponding to the cracking moment is called……

d) The web shear cracks are developed in a simply supported beam
(a) at neutral axis near the support (b) at edges near the support
(c) at neutral axis near the mid span (d) at edges near the mid span

e) The designed anchorage zone in the main reinforcement using transverse stress distribution should withstand the
(a) Compression tension (b) Bursting tension
(c) Anchorage tension (d) Principal tension

f) The prestressed concrete member develops deformation under the influence of
(a) Flexural moments (b) Stress strain diagram
(c) Prestress and transverse loads (d) Self weight

g) The section of sustained transverse loads under compressive stress distribution in the concrete changes with
(a) Time (b) Intensity
(c) Bending moment (d) Curing

h) The minimum section modulus of a prestressed concrete section is influenced by
(a) the range of stress at top fibre (b) the compressive stress at top fibre
(c) range of stress at bottom fibre (d) the compressive stress at top fibre

i) Stressing concordant cables in continuous structures results in
(a) primary reactions (b) primary moments
(c) zero redundant reactions (d) axial thrust

j) The deflection of a beam with parabolic tendon is given as :
(a) –5PeL2/48EI (b) –10PeL2/48EI
(c) –15PeL2/48EI (d) –3PeL2/48EI

Q2 **Answer the following questions : *Short answer type :*** **(2 x 10)**

a) What is 'Pressure Line'? Explain significance with sketch.

b) What are the effects responsible for loss of pre-stress due to friction?

c) What are the methods used in Anchorage zone stress?

d) Differentiate bonded and non bonded pre-stressing concrete.

e) Mention the different types of cracks in a simply supported beam under uniformly distributed load with pre-stressing.

f) What are the sources of pre-stress force?

g) A post tensioned pre-stressed concrete beam of rectangular cross-section 200 mm wide and 400 mm deep is pre-stressed by 300 mm^2 of high tensile bars located at an eccentricity of 100 mm. the characteristic tensile strength of steel is 1600 N/mm^2 and the characteristic concrete strength is 40 N/mm^2 . Find out the reinforcement ratio.

h) Write the functions of stirrups.

i) Draw a sketch showing the stress distribution in end block by double anchor plate.

j) What do you mean by *concordant cable*?

Part – B (Answer any four questions)

Q3 **a)** A pre-stressed concrete beam, 120 mm wide by 300 mm deep, is pre-stressed by a cable which has an eccentricity of 100 mm at the centre of section. The span of the beam is 6 m. If the beam supports two concentrated loads of 10 kN each at one third span points, determine the magnitude of the pre-stressing force in the cable for the following cases: **(10)**

a) Considering live loads but neglecting self weight of the beam.
b) Considering both self weight of the beam and live loads.

b) Distinguish between post tensioned and pre tensioned concrete. **(5)**

Q4 A pre-stress concrete beam spanning over 8 m is of rectangular section, 150 mm wide and 300 mm deep. The beam is pre-stressed by a parabolic cable having an eccentricity of 75 mm below the centroidal axis at the centre of span and an eccentricity of 25 mm above the centroidal axis at the support sections. The initial force in the cable is 350 kN. The beam supports 3 concentrated loads of 10 kN each at intervals of 2 m. $E_c = 38$ kN/mm^2 . **(15)**

a) Neglecting losses of pre-stress, estimate the short term deflection due to pre-stress and self weight.
b) Allowing 20 percent loss in pre-stress, estimate the total long term deflection under pre-stress, self weight and live load assuming creep coefficient as 1.8.

Q5 **a)** A pre tensioned beam 250 mm wide and 300 mm deep is pre-stressed by 12 wires each of 7 mm diameter initially stressed to 1200 N/mm^2 with their centroids located at 100 mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation using IS- 1343 and the following data: **(12)**

Relaxation of steel stress= 90 N/mm^2
E_s =210 kN/mm^2 , E_c = 35 kN/mm^2
Creep coefficient= 1.6
Residual shrinkage strain= $3x10^{-4}$

b) What is anchorage slip? How do you compute the loss of stress due to anchorage slip? **(3)**

Q6 A pre-tensioned T section has a flange 1200 mm wide and 150 mm thick. The width and depth of the rib are 300 and 1500 mm respectively. The high tensile steel has an area of 4700 mm^2 and is located at an effective depth of 1600 mm. If the characteristic cube strength of the concrete and the tensile strength of steel are 40 N/mm^2 and 1600 N/mm^2 respectively. Calculate the flexural strength of the T- section. **(15)**

Q7 A pre-tensioned beam, 80 mm wide and 120 mm deep, is to be designed to support a service load of 5kN at one third point from the left over a span of 4m. If the permissible stresses in tension are zero at transfer and 1.4 N/ mm^2 under working loads, design the number of 3 mm wires and the corresponding eccentricity required at the mid span section. Permissible tensile stress in the wires is 1400 N/ mm^2. The loss of pre-stress is 20 percent. **(15)**

Q8 The support section of a pre-stressed concret beam 100 mm wide by 300 mm deep, is required to support an ultimate shear force of 80 kN. The compressive pre-stress at the centroidal axis is 40 N/mm^2.The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of stirrups is 415 N/mm^2, design suitable shear reinforcement in the section using IS 1343 recommendations. **(15)**

Q9 **Write short notes on any THREE :** **(5 x 3)**

a) Factors influencing deflection

b) Applications and limitations of pre-stressed concrete

c) Various methods of predicting long term deflections of uncracked pre-stressed concrete members.

d) Load balancing concept in pre-stress analysis

e) Cracking load and Cracking moment