GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, December – 2020

(Seventh Semester)

BCEPE 7032 – PRESTRESSED ENGINEERING

(Civil Engineering)

Time: 2 hrs   Maximum: 50 Marks

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)   **(1 x 10 = 10 Marks)**

Q.1. Answer *ALL* questions   [CO#]   [PO#]

a. Which of the following basic concept is involved in the analysis of prestressed concrete members?   CO1   PO4
   (i)Combined and bending stresses   (ii)Principal stresses
   (iii)Shear stresses   (iv)Overhead stresses

b. Hard-drawn steel wires used in high tensile steel are considered as _____   CO1   PO4
   (i)Crimped Elements   (ii)Twisted Elements
   (iii)Durable Elements   (iv)Tempered Elements

c. Which beams are preferred mostly due to their higher flexural strength?   CO2   PO5
   (i)Unbonded beams   (ii)Extended beams
   (iii)Bonded beams   (iv)Exhaustive beams

d. The concept of pressure line is very useful in understanding the concept of _____   CO2   PO5
   (i)Bending mechanism   (ii)Load carrying mechanism
   (iii)Shear mechanism   (iv)Torsion Mechanism

e. The loss of stress due to successive tensioning of curved cables in elastic deformation of concrete is estimated by considering _____   CO3   PO1
   (i)Initial Stress   (ii)Average Stress
   (iii)Bondage Stress   (iv)Anchorage Stress

f. The term anchorage slip means _____   CO3   PO1
   (i) Radius by friction wedges   (ii) Rotation by friction wedges
   (iii) Twisting movement by friction wedges   (iv) Distance moved by friction wedges

g. If the concrete in tension zone get cracks will lead to development of _____   CO4   PO4
   (i)Principal Stresses   (ii)Compression
   (iii)Tensile stresses   (iv)Strain

h. The load deflection curve is approximately linear up to stage of _____   CO4   PO4
   (i)Invisible cracking   (ii)Visible cracking
   (iii)Invisible deflection   (iv)Visible deflection

i. Which of failure is considered in the design of prestressed concrete members for the limit states of collapse?   CO5   PO4
   (i)Total Failure   (ii)Shear Failure
   (iii)Ultimate Failure   (iv)Collapse Failure

j. The strain compatibility method of analysis involves the use of _____   CO5   PO4
   (i)Tension Compression Curves   (ii)Stress Strain Curves
   (iii)Bending Bondage   (iv)Elasticity Curve

PART – B: (Short Answer Questions)　　　　　　**(2 x 5 = 10 Marks)**

Q.2. Answer *ALL* questions　　　　　　　　　　　　　　　　　　[CO#]　　　[PO#]

a. What is meant by cracking moment?　　　　　　　　　　　CO1　　　PO4

b. Name any four systems of Prestressing　　　　　　　　　CO2　　　PO5

c. What are the factors influencing deflection?　　　　　　　CO4　　　PO4

d. A PSC beam has a symmetric parabolic cable profile with zero eccentricity at ends and with maximum eccentricity 'e' at mid span of length. What is the upward deflection?　　CO4　　　PO4

e. State circular pre-stressing.　　　　　　　　　　　　　　CO5　　　PO4

PART – C: (Long Answer Questions)　　　　　　**(6 x 5 = 30 Marks)**

Answer *ANY FIVE* questions　　　　　　　　　　Marks　　[CO#]　　[PO#]

3. Analyse the given prestressed concrete section of cross sections 300mm x 600mm having a span of 10m. A pre stressing cable of area 500mm^2 is used for pre stressing. A pre stress of 1500N/mm^2 is used to tension the steel having parabolic profile. The density of concrete is 25KN/m^3 and live load on structure is 15KN/m. Compare the theories of concept and obtain the stress variations in prestressed concrete beam. Take e=200 mm.　　(6)　　CO1　　PO4

4. A Pre tensioned beam 200 mm wide and 300 mm deep is pre stressed by 10 wires of 7 mm diameter initially stressed to 1200 N/mm^2, with their centroids located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. If the concrete undergoes a further shortening due to creep and shrinkage while there us a relaxation of 5% of steel stress, estimate the final percentage loss of stress in the wires using IS 1343 – 1980 regulations with the following E_s=210KN/mm^2, E_c=5700 $(f_{cu})^{1/2}$ where f_{cu} = 42 N/mm^2, Φ=1.6, total residual shrinkage strain = 3x10^4.　　(6)　　CO1　　PO4

5. A pre stressed concrete T section has 1800 mm X 200 mm flange, 450 mm x 1500 mm rib and 100 nos of 8 mm HTS wires are located at 1600 mm from the top of flange. Calculate the flexural strength of the beam using M_{40} and Fe 1600.　　(6)　　CO2　　PO5

6. Differentiate between pre tensioning and post tensioning　　(6)　　CO2　　PO5

7. A concrete beam with a rectangular section 150 mm wide and 300 mm deep is stressed by 3 cables, each carrying an effective force of 200 KN. The san of the beam is 12 m. The first cable is parabolic with an eccentricity of 50 mm below the centroidal axis at supports. The second cable is parabolic with zero eccentricity at the supports and an eccentricity of 50 mm at the centre of the span. The third cable its straight without uniform eccentricity of 50 mm below the centroidal axis. If the beam supports an uniformly distributed live load of 6 KN/m and E_c = 38 KN/mm^2. Calculate the instantaneous deflection at the following stages.　　(6)　　CO3　　PO1

(i)   Pre stress + Self weight of the beam

(ii)   Pre stress + Self weight + Live load

8. Calculate the long term deflection at mid span of the 8 m span of beam with 300 mm width 800 mm deep is subjected to an effective pre stress of 2400 KN. The shape of the cable is parabolic having 200 m from bottom at centre and ends of cable at 400 mm at top. Assume concrete stress at transfer and at application of load = 40 N/mm^2. $E_c = 3.33 \times 10^4$ N/mm^2, $E_s = 2 \times 10^5$ N/mm^2, $C_c = 3.0$, Shrinkage strain 2×10^{-4}, Relaxation of steel = 5% of f_{pe}.   (6)   CO3   PO1

9. A continuous pre stressed concrete beam ABC (AB = BC = 10 m) has a uniform rectangular cross section with a width of 100 mm and a depth of 300 mm. The cable carrying an effective pre stressing force of 360 N is parallel to the axis of the beam and located at 100 mm from the soffit.   (6)

    a) Determine the secondary and resultant moment at the central support B   CO4   PO4

    b) If the beam supports an imposed load of 1.5KN/m. Calculate the resultant stresses at top and bottom of the beam at B. Assume density of concrete as 2.4 KN/m^3

    c) Locate the resultant line of thrust through beam AB.

10. Explain the factors influencing the deflection and the effect of tendon profile in the deflection of PSC members with a neat sketch.   (6)   CO5   PO4

--- End of Paper ---