Code No: RR310101 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2006
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss in detail how the chemical composition of cement affects its strength & setting properties.
   (b) Explain the difference between Natural and Artificial cement.

   [10+6]

2. (a) "The bulk density of aggregate gives valuable information regarding its shape and grading". Explain this statement.
   (b) Explain the laboratory tests to determine the bulk density of aggregates.

   [8+8]

3. Compressive Strength Test was conducted on six cubes of size 150 X 150 X 150mm.The ultimate loads recorded are 456KN, 450KN, 462KN, 458KN,455KN, 450KN.Compressive strength test on six cylinders of size 150mm dia X300 mm height of same concrete recorded following ultimate loads. 288KN, 292KN,297KN,293KN,292KN, 290KN for the above results calculate.
   (a) Cube Compressive Strength
   (b) Cylinder Compressive Strength
   (c) Comment on grade of concrete
   (d) Ratio of cylinder strength to cube strength.

   [4+4+4+4]

4. (a) Describe in detail the Absolute volume method of Mix Design.
   (b) For a particular concrete Mix, the details are as given below.
   Specific Gravity of Cement = 3.10
   Specific Gravity of Fine Aggregate = 2.70
   Specific Gravity of coarse aggregate = 2.72
   Total water content = 190Kg/Cum of concrete
   Entrapped air content = 2%
   Total cement content = 380 kg/cum of concrete
   Percentage of fine aggregate = 34%
   Using absolute volumes, calculate the quantities of coarse aggregate and fine aggregate required for one cubic metre of concrete.

   [8+8]

5. A prestressed concrete beam section is 250 mm wide and 300 mm deep. The initial prestressing force is 450 KN at an eccentricity of 60 mm. The beam has a span of 5.75 m and has to carry a superimposed load of 7.50 KN/m. Analyse the beam section for the stresses produced at mid span before and after the application of the live load. Allow a loss of prestress at 15 % . Take weight of concrete equal to $24KN/m^3$. [16]

6. A prestressed concrete beam of rectangular cross section 160mm wide and 330mm deep is prestressed by 8 wires of 7mm diameter wires located at 110mm from the soffit of the beam. If the wires are initially tensioned to a stress of 1200MPa. Calculate the stresses at transfer and the effective stress after all losses. Take $E_S = 208kN/mm^2$ $E_C = 33.5kN/mm^2$ Give the following data.

	Up to time of transfer	Final stage
(a) Relaxation of steel	$37N/mm^2$	69MPa
(b) Shrinkage of concrete	$101\text{x}10^{-6}$	$309\text{x}10^{-6}$
(c) Creep of concrete	-	$59\text{x}10^{-6}$ per MPa.

[16]

7. A prestressed concrete beam of uniform rectangular cross section and span 15 m supports a total distributed load of 272 KN excluding the weight of the beam. Determine the suitable dimensions of the beam and calculate the area of the tendons and their position. The permissible stresses are $14N/mm^2$ for concrete and $1050N/mm^2$ for the tendons. [16]

8. A prestressed beam of rectangular section 20 cm x 45 cm is prestressed by a triangular tendon carrying an effective prestress of 350 KN. It has a maximum eccentricity of 100 mm at midspan. The beam supports a uniform load of 10 KN/m over a span of 10 m. Determine the principal stresses at the support section. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR310101 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2006
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. What are tests available to determine the fineness of cement? Explain them in detail with the help of neat sketches? [6+10]

2. (a) Describe compaction factor test for measurement of workability of concrete? How is this method superior to slump test?
   (b) Describe the methods available for measurement of workability of a "low workable concrete".

   [8+8]

3. (a) What do you understand by "Grade of concrete"? Discuss different grades of concrete as per IS-456-2000.
   (b) Describe in detail the Accerlated curing test for concrete? Bring out its advantages and limitations.

   [8+8]

4. Design a M20 concrete Mix using IS method of Mix design. Use following data.
   (a) Maximum size of Aggregate - 20mm (Angular)
   (b) Degree of workability - 0.90 compaction factor
   (c) Quality Control - good
   (d) Type of Exposure - mild
   (e) Specific gravity
      i. Cement -3.10
      ii. Sand -2.60
      iii. Coarse aggregate - 2.62
   (f) Water absorption:
      i. coarse aggregate-0.60%
      ii. fine aggregate - 1.50%
   (g) Free surface moisture:
      i. coarse aggregate -NIL
      ii. fine aggregate -2.5%
   (h) Sand conforms to zone III grading.
   Assume any other Data required suitably.

[16]

5. A prestressed concrete beam 400 mm wide and 620 mm deep has a span of 5.6m. The beam is prestressed with a tendon as shown in fig**??**. The external load on the beam consists of 200 kN at midspan. The effective prestressing force is 1100 kN. Calculate the resultant extreme fibre stresses at mid span section. Concrete weighs $25kN/m^3$.

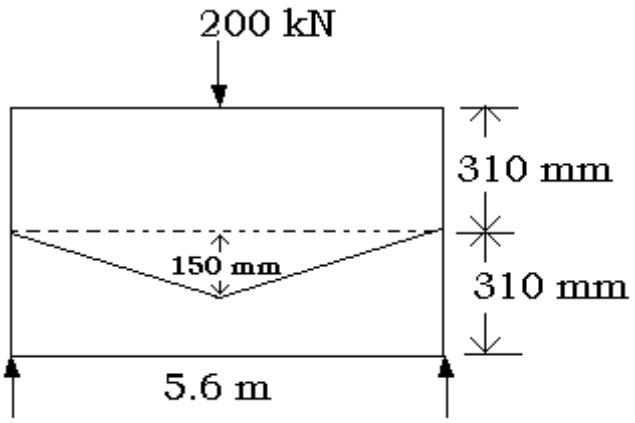

Figure 5

[16]

6. A prestressed concrete beam 250mm wide and 320mm deep is prestressed with steel wires of area $220mm^2$ provided at an uniform eccentricity of 60mm and subjected to an initial stress of $1050N/mm^2$. The span of the beam is 10m. Find the percentage loss of stress.

   (a) $E_S = 205kN/mm^2 and E_C = 32kN/mm^2$

   (b) Shrinkage of concrete $\left.\begin{array}{l} = 300\text{x}10^{-6} \text{ for pretensioned beam and} \\ = 210\text{x}10^{-6} \text{ for posttensioned beam} \end{array}\right\}$

   (c) Ultimate creep strain of concrete $\left.\begin{array}{l} = 47 \times 10^{-6}\, mm/mm\, per\, Mpa\, for\, pretensioned\, beam \\ = 28 \times 10^{-6}\, mm/mm\, per\, Mpa\, for\, posttensioned\, beam \end{array}\right\}$

   (d) Relaxation of stress in steel = 6 % of the initial stress

   (e) Anchorage slip = 0.70 mm

   (f) Friction coefficient for wave effect = 0.0014 per m

   (g) Coefficient of friction = 0.55 [16]

7. A rectangular beam 200 X 450 mm has a span of 10 metres. The prestressing cable has a trapezoidal cable with zero eccentricity at the ends and 70 mm at one third span points. The effective prestress is 750kN after all losses. Determine the value of equal point loads the beam can support at the one third points if the pressure line passes through the upper kern of the section.

[16]

8. The horizontal stress at the centroid of a prestressed concrete beam of rectangular cross section is 125 mm x 250 mm is $7N/mm^2$ and the maximum shearing force on the beam section is 68 KN. Find the principal tensile stress. Also find the minimum vertical prestress required to eliminate this principal tensile stress.

[16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR310101 **Set No. 3**

III B.Tech I Semester Regular Examinations, November 2006
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. What are tests available to determine the fineness of cement? Explain them in detail with the help of neat sketches? [6+10]

2. (a) Differentiate between gap grading and continuous grading of aggregate.
   (b) How do you conduct sieve analysis on coarse aggregate in the laboratory.

   [8+8]

3. Describe the 'Split Tension' and 'Ring Tension' Tests for determining the Tensile strength of concrete. Bring out the advantages and Limitations of each test. [16]

4. Explain in detail the various steps involved in Designing concrete mixes by American Concrete Institute Method. [16]

5. What are the different post tensioning systems? Explain any two of them in detail along with neat sketches. [16]

6. A prestressed concrete beam of rectangular cross section 160mm wide and 330mm deep is prestressed by 8 wires of 7mm diameter wires located at 110mm from the soffit of the beam. If the wires are initially tensioned to a stress of 1200MPa. Calculate the stresses at transfer and the effective stress after all losses. Take $E_S = 208kN/mm^2$ $E_C = 33.5kN/mm^2$ Give the following data.

	Up to time of transfer	Final stage
(a) Relaxation of steel	$37N/mm^2$	69MPa
(b) Shrinkage of concrete	$101\text{x}10^{-6}$	$309\text{x}10^{-6}$
(c) Creep of concrete	-	$59\text{x}10^{-6}$ per MPa.

   [16]

7. A beam 260 mm wide and 600 mm deep is simply supported over an effective span of 7.6m. It carries two point loads of 65 kN each at 2m from either support. Determine the initial prestressing force and its eccentricity assuming that no tension is permitted in concrete both at transfer and service load. Assume the loss ratio as 0.86. [16]

8. Discuss in detail how the shear is developed in prestressed concrete beams under different loadings and evolve the expression for design shear.

   [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR310101 **Set No. 4**

III B.Tech I Semester Regular Examinations, November 2006
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Discuss the difference between the wet and dry process of manufacturing of Portland cement.
   (b) Draw the flow diagrams for wet & dry process of manufacture of cement & explain the same.

   [8+8]

2. (a) Explain the significance of Flakiness index and Elongation index of coarse aggregates?
   (b) Explain the tests to determine the following
      i. Flakiness index
      ii. Elongation index.

   [8+8]

3. (a) Explain the effect of Height/Diameter ratio on strength of concrete. What is the correction factor for this.
   (b) Compare 'Centre point Loading Test' and 'Third point loading Test' for flexural strength of concrete.

   [8+8]

4. (a) Explain how do you account for variation in test results of concrete
   (b) Define the term co-efficient of variation and explain how it is useful in quality control of concrete.

   [8+8]

5. A pretensioned concrete beam of 300 mm x 600 mm cross section is stressed by 20 - 8 mm high tensile steel wires, located at 200 mm below the centre line of the section. If the characteristic strength of concrete is $45N/mm^2$ and the characteristic strength of prestressing steel is $1400N/mm^2$, determine the moment of resistance of the section. [16]

6. A prestressed concrete beam 250mm wide and 320mm deep is prestressed with steel wires of area $220mm^2$ provided at an uniform eccentricity of 60mm and subjected to an initial stress of $1050N/mm^2$. The span of the beam is 10m. Find the percentage loss of stress.
   (a) $E_S = 205kN/mm^2 and E_C = 32kN/mm^2$

(b) Shrinkage of concrete $\left.\begin{array}{l} \\ \end{array}\right\}$ $= 300\text{x}10^{-6}$ for pretensioned beam and
$= 210\text{x}10^{-6}$ for posttensioned beam

(c) Ultimate creep strain of concrete $\left.\begin{array}{l} \\ \\ \end{array}\right\}$ $= 47 \times 10^{-6}\, mm/mm\, per\, Mpa\, for\, pretensioned\, beam$
$= 28 \times 10^{-6}\, mm/mm\, per\, Mpa\, for\, posttensioned\, beam$

(d) Relaxation of stress in steel = 6 % of the initial stress

(e) Anchorage slip = 0.70 mm

(f) Friction coefficient for wave effect = 0.0014 per m

(g) Coefficient of friction = 0.55 [16]

7. (a) Write in detail the approximate method of design of prestressed concrete Beams?

   (b) Derive the expression for eccentricity to be used in design?

   [8+8]

8. A prestressed concrete beam of rectangular section is 150mm wide, 375 mm deep is simply supported over a span of 8 m. The beam is concentrically prestressed by a cable carrying an effective prestressing force of 337.50 KN. The beam supports an all inclusive load of 8 KN/m. Compare the principal tensile stresses induced in the beam with and without the prestress at the support section.

   [16]

⋆ ⋆ ⋆ ⋆ ⋆