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

III B.Tech. I Semester Regular Examinations, November -2005
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss the chemical composition of ordinary Portland cement.
   (b) What are the Indian Standard specifications as per I.S. 269-1989 for 33 grade ordinary Portland cement with respect to chemical requirements.

   [8+8]

2. (a) What is fineness modulus of aggregates? What does it indicates?
   (b) In laboratory explain how you will conduct test to obtain fineness modulus of aggregates?

   [8+8]

3. (a) How does the maximum size of coarse aggregate affects the strength of Hardened concrete.
   (b) Laboratory experiments conducted in Mumbai on a particular mix showed a strength of 33 MP a for a fully matured concrete. Find whether formworm can be removed for an identical concrete placed at Jammu at the age of 15 days when the average temperature is 6^0C. The stripping stress in concrete may be taken as 25 Mpa.The Plowman's Constants may be assumed as 21 and 61.

   [8+8]

4. (a) Discuss the various requirements as per ACI method, for w/c ratio and strength for special exposure conditions.
   (b) Discuss the various factors in the choice of Mix Proportions.

   [8+8]

5. (a) Give the classification of the various methods and systems of prestressing.
   (b) With the help of neat sketches explain any one method of pre-tensioning and post-tensioning.

   [8+8]

6. (a) A straight post-tensioned concrete member 14m long with a cross-sectional area $920mm^2$. This steel is made of four tendons with $230mm^2$ per tendon. The tendons are tensioned to a stress of $1200N/mm^2$. determine the loss of prestress in each tendon due to elastic shortening of concrete. Find also the average percentage loss of prestress. If it is desired that after the last tendon is tightened a stress of $1200N/mm^2$. be maintained in each tendon, 6. compute the actual stresses to which the individual tendous should be tightened m=6

(b) Determine the loss of stress in tendons due to shrinkage of concrete in a post-tensioned beam if the age of concrete at transfer is 28 days. Take $E_S = 207kN/mm^2$.

[8+8]

7. Design a prestressed concrete beam to the following requirements:

   (a) Span : 15 m
   (b) Superimposed load : 34 KN/m
   (c) Cube strength of concrete at 28 days : $35N/mm^2$
   (d) Safe stress in concrete at transfer of prestress fs : $0.5f_{ck}$
   (e) Safe stress in concrete due to final prestress fc : 0.4 fck
   (f) Total loss of prestress : 20%
   (g) Allowable tensile stress in concrete : $0.129\ \sqrt{fck}$
   (h) Ultimate stress in steel: $1500N/mm^2$
   (i) Safe stress in steel : 60 % ultimate stress

[16]

8. A prestressed concrete beam section has the sectional properties and the stresses as follows:
   Width of Top flange : 2400 mm
   Depth of Top flange : 400 mm
   Web width : 600 mm
   Depth of web : 1000 mm
   Width of bottom flange : 1200 mm
   Depth of bottom flange : 900 mm
   Max bending stress at top fibre : $13N/mm^2$
   Max bending stress at bottom fibre : $0N/mm^2$
   Shear stress at Neutral axis : $2.36N/mm^2$
   Shear stress at Junction of web and bottom flange : $2.26N/mm^2$
   The total vertical shear in concrete at the section is 2360 KN. Find the principal tensile stress at the centroidal axis and at the Junction of the web with the lower flange. [16]

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

III B.Tech. I Semester Regular Examinations, November -2005
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain in detail the formation of Bouge's compounds.
   (b) Discuss the effect of Tricalcium Silicate on the setting properties of cement.

   [10+6]

2. Bring out the detailed classification of aggregates and explain each one of them briefly. [16]

3. (a) Define the term creep of concrete and explain the same.
   (b) Describe the laboratory test for the measurement of creep of concrete.

   [8+8]

4. (a) Discuss the various requirements as per ACI method, for w/c ratio and strength for special exposure conditions.
   (b) Discuss the various factors in the choice of Mix Proportions.

   [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) A concrete beam is post tensioned by cable carrying an initial stress of 1075MPa. The slip at the jacking end was observed to be 6mm. Estimate the percentage loss of stress due to anchorage slip if the length of beam is 12m.
   Take E_{St}= 206kN/mm^2.
   (b) A post tensioned cable of a beam 10m long is initially tensioned to a stress of 1050 MPa at one end. If the tendons are curved so that the slope is 1 in 22 at each end with cross sectional area of $620mm^2$. Calculate the loss of prestress due to friction using the following data.
      i. Coefficient of friction = 0.52
      ii. Friction coefficient for wave effect = 0.0015 per m
      During anchoring if there is slip of 4mm at the jacking end, calculate the final force in the cable and the percentage loss of presteress.

   [8+8]

7. A prestressed concrete beam 200 mm wide and 300 mm deep is used an effective span of 5m to support an imposed load of 5kN/m. The density of concrete is $24kN/m^3$. At the quarter span section of the beam, find the magnitude of

   (a) The concentric prestressing force necessary for zero fibre stress at the soffit when the beam is fully loaded and

   (b) The eccentric prestressing force located 100 mm from the bottom of the beam, which would modify the bottom fibre stress due to loading.

   [8+8]

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]

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

III B.Tech. I Semester Regular Examinations, November -2005
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss the water requirements of different Bouge's compounds in hydration process.
   (b) Draw schematic of composition of cement paste at different stages of hydration.

   [8+8]

2. (a) "A concrete technologist should have a comprehensive knowledge of workability in designing a mix". Explain how the mix design of concrete is affected by workablility
   (b) Explain how the following factors affect the workability.
      i. size of aggregates
      ii. shape of aggregates
      iii. water content
      iv. grading of aggregates.

   [8+8]

3. (a) Why the compressive strength is an important property of concrete. Discuss factors that affect the compressive strength.
   (b) Compressive strength that conducted on 6 samples of 150X150X150mm Cubes at 28 days age given the following crushing loads: 110KN,115KN,112KN,108KN,113 KN and 114KN. Compute the cube compressive strength of concrete and comment on its grade.

   [8+8]

4. Design a concrete Mix for construction of an elevated water tank. The characteristic compressive strength of concrete is 30 Mpa at 28 days. Assume standard deviation as 4 Mpa. The specific gravities of coarse and fine aggregates are 2.64 and 2.68 respectively. The dry rodded bulk density of Coarse Aggregate is 1600 Kg/cum. And fineness modulus of Sand is 2.80 OPC (Type I) is to be used. A slump of 50 mm is required. The water absorption of coarse Aggregate is 1% and free surface moisture in sand is 2%. Assume any other Data Missing suitably. Use ACI Method. [16]

5. A P.S.C beam 40cm x 60cm(deep) is of span 6m. It is prestressed with a bent tendon having zero eccentricity at ends and 15cm at mid-span. It carries an eternal board of 20kN at mid-span. If the effective prestressing force is 1200kN, calculate the

extreme fibre stresses at mid-span section. Take density of concrete an $24kN/m^3$. Sketch the stress diagrams.

[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 concete $\left.\begin{array}{l} \\ \\ \end{array}\right\}$ $= 45\text{x}10^{-6}$mm/mm per MPa for pretensioned $= 26\text{x}10^{-6}$mm/mm per MPa for post tensioned

   (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 200mm x 450 mm has a span of 8 m. The prestressing cable has a parabolic profile with zero eccentricity at ends and 65 mm at midspan. The effective prestress is 750 kN after all losses. Determine the value of a uniform load that the beam can support if the pressure line passes through the upper Kern at midspan. [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]

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

III B.Tech. I Semester Regular Examinations, November -2005
CONCRETE TECHNOLOGY AND PRESTRESSED CONCRETE
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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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. Explain the following with reference to the properties of fresh concrete :
   (a) Segregation
   (b) Bleeding

   [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. 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) What is the need for using high tension steel instead of mild steel in PSC?
   (b) Why do you go for high grade concrete instead of ordinary concrete in PSC?

[8+8]

6. A post tensioned cable of a beam 10m long is initially tensioned to $1000 N/mm^2$at one end. Calculate the loss due to friction if the tendons are curved having slope of 1 in 24 at each end. Take $\mu = 0.3$ and k=0.0015/m.

[16]

7. A rectangular beam 200mm x 450 mm has a span of 8 m. The prestressing cable has a parabolic profile with zero eccentricity at ends and 65 mm at midspan. The effective prestress is 750 kN after all losses. Determine the value of a uniform load that the beam can support if the pressure line passes through the upper Kern at midspan. [16]

8. A P.S.C beam (150mm x 300mm) is prestressed with a parabolic tendon having an eccentricity of 100mm at wide span and 0 at ends. If it carries a live load of 4 kN/m find the percentage change in principal tension with the case of beam without any prestress. [16]

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