

**III B.Tech. I Semester Supplementary Examinations, April/May -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 and explain the same.
2. (a) Explain the purpose of aggregates in concrete.  
(b) How does the source affects the quality of aggregate?
3. (a) What do you understand by the term "workability"?  
(b) Discuss the various factors affecting the workability of concrete?
4. Write short notes on:
  - (a) Third point load test for flexure
  - (b) Indirect Tension Tests
  - (c) Rebound Hammer Test.
5. (a) What are general principles of prestressing.  
(b) Explain in detail about prestressing and post tensioning.
6. A post tensioned rectangular beam (40cm x 60cm) and 10m span is tensioned by providing straight tendon stressed to  $1000\text{N/mm}^2$  at the jacking end. Find the loss of prestress due to wobble effect at
  - (a) mid-span
  - (b) at the remote end innovate taking  $k=0.3$  per 100m.
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. 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.

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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.
2. Explain how the following characteristics of aggregates affect the properties of concrete.  
(a) Size  
(b) Shape
3. (a) What is the effect of mixing time and temperature on workability.  
(b) Discuss the various factors which influence the workability of fresh concrete.
4. (a) With the help a neat sketch explain Third Point loading Test for flexural strength of concrete.  
(b) Explain how do you estimate the compressive strength of concrete from Rebound Number.
5. (a) What are the advantages and limitations of PSC over RCC.  
(b) What are the advantages of using High tension steel and high strength concrete in PSC members?
6. A post tensioned cable of a beam 10m long is initially tensioned to  $1000\text{N/mm}^2$  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  $k = 0.0015/\text{m}$ .
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  $14\text{N/mm}^2$  for concrete and  $1050\text{N/mm}^2$  for the tendons.
8. A prestressed concrete beam of rectangular section 180 mm wide and 350 mm deep is simply supported over a span of 10 m. The beam is concentrically prestressed by a cable carrying an effective prestressing force of 325 KN. The beam carries an all inclusive load of 9 KN/m. Find the principal tensile stress at the support section. In case the cable has a parabolic profile with an eccentricity of 125 mm at the centre of span, and zero at the supports, find the percentage reduction in the principal tensile stress at the support section.

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1. (a) Discuss in detail how the chemical composition of cement affects its strength and setting properties.  
(b) Explain the difference between Natural and Artificial cement.
2. (a) How do you classify aggregates based on the shape of the particle.  
(b) What is Angularity index? How is it calculated? What is its importance.
3. "Slump test is the most commonly used method of measuring workability of fresh concrete in field". Explain in detail the slump test with the help of a neat sketch. Discuss its merits and limitations.
4. Describe the 'Split Tension' and 'Ring Tension' Tests for determining the Tensile strength of concrete. Bring out the advantages and Limitations of each test.
5. What are the different post tensioning systems? Explain any two of them in detail along with neat sketches.
6. A simply P.S.C beam (30cm x 80cm) and of span 15m is prestressed by a parabolic cable having max central eccentricity of 250mm at mid-span. Taking  $\mu = 0.35$  and  $K_f = 0.15$  per 100m find the loss due to effect of friction.
7. A beam 250 mm wide and 600 mm deep is simply supported over an effective span of 8m. It carries two point load of 55 kN each at 2.5m 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 loss ratio as 0.85.
8. The horizontal stress at the centroid of a prestressed concrete beam of rectangular cross section is 125 mm x 250 mm is  $7\text{N/mm}^2$  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.

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1. (a) "The hydration of cement is an exothermic reaction". Discuss the above statement with valid facts in connection with hydration process of cement  
(b) Explain the structure of hydrated cement.
2. (a) What is the meaning of surface texture of the aggregate. Explain in detail how the surface texture influences the properties of the concrete.  
(b) What are the different methods of measuring surface texture of aggregates?
3. (a) How does the moisture content on aggregates affect the workability of fresh concrete?  
(b) With the help of neat sketch explain compaction factor test for measuring workability.
4. With the help of a neat sketch explain in detail the 'Rebound Hammer' Test on concrete. What are the various limitations of this test.
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<sup>3</sup>.
6. (a) Name the various losses to be considered in the prestressed concrete beams.  
(b) Discuss the loss due to friction in detail. Derive the formula used for calculating the loss.
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.
8. A Prestressed beam of 180mm x 300mm is axially prestressed by a tendon carrying an effective force of 300kN. The beam supports a uniform load of 12 kN/m over a span of 8m. Determine the principal stresses at the support section. If this beam is also prestressed in the vertical direction with a stress of 5N/mm<sup>2</sup>. Determine the principal stresses at the support sections.

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