

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), Dec.2015

B. Tech in Civil Engineering, Semester-VII

COURSE CODE: DESIGN OF PRE-STRESSED
CONCRETE STRUCTURES (CE 728)

Roll No.....
Time: 3 hours Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly. Use Density of concrete = 24 KN/m^3 .
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever required are an integral part of the answer.

Q.1A Objective type multiple choice/ fill in the blank questions (10 questions @ 1 mark) 10

- i. Minimum strength of concrete for prestress is ; (a) M-20 (b) M-25 (c) M-30 (d) M-40
- ii. Anchorage slip is found in (a) pre tensioning (b) Post tensioning (c) Axial prestressing (d) Partial prestressing.
- iii. Loss due to elastic deformation of concrete ; (a) $m \cdot f_c$ (b) $m \cdot f_s$ (c) both (d) none
- iv. Write expression for loss due to anchorage slip. _____
- v. Guyon investigated stress distribution pattern for y_{p0}/y_p values from 0 to ; (a) 0.2 (b) 0.3 (c) 0.4 (d) 0.5
- vi. Maximum shear stress in any rectangular section is _____ times of average stress ; (a) 1.0 (b) 1.25 (c) 1.5 (d) 1.75
- vii. Modulus of elasticity of concrete $\frac{1}{3} \sqrt{f_{ck}}$; (a) 3000 (b) 4000 (c) 5000 (d) 6000
- viii. Partial safety factor for steel ; (a) 1.0 (b) 1.15 (c) 1.25 (d) 1.5
- ix. Partial safety factor for concrete; (a) 1.0 (b) 1.15 (c) 1.25 (d) 1.5
- x. Expression for creep loss in prestressed concrete: _____

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- (a) Define full, limited and partial prestressing.
- (b) Write difference between creep of concrete and shrinkage of concrete.
- (c) Write Indian code provisions for determination of bursting tension in end blocks.
- (d) Define any five terms used in prestressed concrete structures.

Q.3 A beam of length 6m having rectangular section 200×300 having 5mm diameter wires 15 nos. at 65 from bottom and 3 nos. at 25 mm from top, prestressed at 840 N/mm^2 . Beam is supporting dead load and live load of 6 KN/m . Find extreme fibre stresses at mid span. 10

OR

Q.3A A prestress concrete beam 200×600 of length 10m is bearing a live load 4 KN/m . Find effective prestressing force with eccentricity 100mm at centre to balance the external moment due to dead load and live load. 05

Q.3B Derive expression to compute loss of prestress due to friction, including curvature and wave effect. 05

- Q.4A Describe Magnel's method for determination of principal stresses at end block. 05
- Q.4B A post tensioned PSC beam 300x300 is subjected to an axial force 832800 N by a fressinet anchorage area 11720 mm². Design and detail the anchorage reinforcement for the end block. Use mild steel of $f_y=260$ KN/mm². 05
- Q.5A Write and describe the expressions for determination of flexural strength of a prestressed member. 05
- Q.5B A prestressed concrete beam of span 10m of rectangular section of 120x300, is axially prestressed by 180 KN force. The beam supports udl of 5 KN/m including self wt. Compare the magnitude of the principal tension developed at centre of the section in the beam with and without the axial prestress. 05
- Q.6A Write down the expression for maximum shear stress due to torque (T) in the circular, rectangular and flanged section. 05
- Q.6B A pretensioned girder having T-section is made up of a flange 200x60. The overall depth is 660mm and thickness web is 60mm. Horizontal compression in concrete due to prestressing is 10 N/mm². Shear stress due to transverse loads is 2.5 N/mm². Determine the increase in the principal tensile stress at the same point if the T-section is subjected to a Torque of 2 KN-m. 05
- OR
- Q.6B A pretensioned T-section having flange 1200x150, Rib 300x1500, $A_p=4700$ mm² $d=1600$ mm, $f_{ck}=40$ N/mm², $f_p=1600$ N/mm². Calculate the flexural strength. ($f_{pu}/0.87 f_p=1.0$ and $X_u/d=0.58$). 05
- Q.7A Why continuity in PSC construction is advantageous? Explain. 05
- Q.7B Write five important stages which should be considered for design of a PSC pipe. 05
- OR
- Q.7B Design a prestressed concrete pipe 600 mm diameter, to withstand hydrostatic pressure 1.05 N/mm², using 2.5 mm HTS wire stressed to 1000 N/mm² at transfer. Permissible maximum and minimum stresses in concrete at transfer and service loads are 14 and 0.7 N/mm². Loss rate is 0.8. Calculate the pitch of winding wire. 05
- Q.8 A rectangular concrete beam 300x800 supports two point load of 20 KN each at third point of span of 9m. (a) Suggest a cable profile and prestressing force to balance bending effect neglecting the self weight and considering $e=100$ mm; (b) for the same cable profile find the effective prestressing force if the resultant stress at bottom fibre of mid span is zero due to self wt., live load and prestressing force. 10
- Q.9 Illustrate various loading stages for prestress design. 10
- Q.10 Derive the expressions (Section modulus, prestressing force and eccentricity) for design of section for flexure. 10
- OR
- Q.10 Enumerate and explain the various types of losses in prestress concrete design. 10