Q.P. Code: **16CE2005** **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
M.Tech I Year I Semester (R16) Regular Examinations January 2017
ADVANCED PRESTRESSED CONCRETE
(Structural Engineering)
(For Students admitted in 2016 only)

Time: **3 hours** Max. Marks: **60**

(Answer all Five Units **5 X 12 =60** Marks)

UNIT-I

Q.1 a. Explain the need for high-strength steel and concrete in prestressed concrete. 6M

b. What are the advantages of prestressed concrete? 6M

OR

Q.2 a. Explain Gifford Udall system with the help of neat sketch. 6M

b. Explain the Magnel-Balton post-tensioning system with neat sketch. 6M

UNIT-II

Q.3 A post-tensioned cable of beam 10 m long is initially tensioned to a stress of 1000 N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 24 at each end, with an area of 600 mm^2,calculate the loss of prestress due to friction using the following data: Coefficient of friction between duct and cable = 0.55; friction coefficient for wave effect =0.0015. During anchoring, if there is a slip of 3 mm at the jacking end, calculate the final force in the cable and the percentage loss of prestress due to friction and slip. E_S=210 KN/mm^2. 12M

OR

Q.4 A concrete beam *AB* of 20 m span is post-tensioned by a cable carrying a stress of 1000 N/mm^2 at the jacking end A. The cable is parabolic between the supports *A and B* and is concentric at the supports with an eccentricity of 400 mm at the centre of span. The coefficient of friction between duct and cable as 0.35 and friction coefficient for wave effect is 0.15 for 100 m. Calculate the stress allowing for losses due to friction and wave effect at the following points:
a) Assuming the jacking end as *A*, compute the effective stress at *B.*
b) If the cable is tensioned from both ends *A* and *B*, calculate the minimum stress after losses in the cable and its location.
12M

UNIT-III

Q.5 An unsymmetrical I-section beam is used to support an imposed load of 2 KN/m over a span of 8m. The sectional details are top flange, 300 mm wide and 60 mm thick ; bottom flange , 100 mm wide and 60 mm thick; thickness of the web=80 mm; overall depth of the beam=400 mm. At the centre of the span , the effective prestressing force of 100 KN is located at 50mm from the soffit of the beam. Estimate the centre-of-span section of the beam for the following load conditions: a) prestress + self-weight and b) prestress+ self-weight+ live load. 12M

OR

Q.6 A rectangular concrete beam of cross section 30 cm deep and 20 cm wide is prestressed by means of 15 wires of 5 mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter of 5 mm, 2.5 cm from the top. Assuming the prestress in the steel as 840 N/mm^2, calculate the stresses at the extreme fibers of the mid-span section when the beam is supporting its own weight over a span of 6 m. If a uniformly distributed live load of 6 KN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 KN/m^3. 12M

UNIT-IV

Q.7 A prestressed I-section has the following properties:

Area =$(55*10^3)$ mm^2

Second moment of area=$(189*10^7)$ mm^4

Statical moment about the centroid=$(468*10^4)$ mm^3

Thickness of web = 50 mm

It is prestressed horizontally by 24 wires of 5 mm diameter and vertically by similar wires at 150 mm centers. All the wires carry a tensile stress of 900 N/mm^2. Calculate the principal stresses at the centroid when a shearing force of 80KN acts upon this section. 12M

OR

Q.8 A prestressed girder of rectangular section 150 mm wide by 300 mm deep is to be designed to support an ultimate shear force of 130 KN. The uniform prestress across the section is 5 N/mm^2. Given the characteristic cube strength of concrete as 40 N/mm^2 and Fe-415 HYSD bars of 8 mm diameter, design suitable spacing for the stirrups conforming to the Indian standard code IS:1343 recommendations. Assume cover to the reinforcement as 50 mm. 12M

UNIT-V

Q.9 A prestressed concrete circular cylindrical required storing 24500 million liters of water. The permissible compressive stress in concrete at transfer should not exceed 13 N/mm^2 and the minimum compressive stress under working pressure should not be less than 1N/mm^2. The loss ratio is 0.75. High-tensile steel wires of 7 mm diameter with an initial stress of 1000 N/mm^2 are available for winding round the tank. Freyssinet cables of 12 wires of 8 mm diameter which are stressed to 1200 N/mm^2 are available for vertical prestressing. The cube strength of concrete is 40 N/mm^2. Design the tank walls supported on elastomeric pads. Assume the coefficient of friction as 0.5.
Volume of tank = $24500*10^6$ liters.
Assuming the diameter of tank as 50 m, height of storage =12.5m. 12M

OR

Q.10 A post-tensioned roof girder spanning over 30 m has an unsymmetrical I-section with a second moment of area of section of $(72490*10^6)mm^4$ and an overall depth of 1300 mm. the effective eccentricity of the group of parabolic cables at the centre of span is 580 mm towards the soffit and 170 mm towards the top of beam at supports. The cables carry an initial prestressing force of 3200 KN.

The self weight of the girder is 10.8 KN/m and the live load on the girder is 9 KN/m. the modulus of elasticity of concrete is 34 KN/mm^2. If the creep coefficient is 1.6, and the total loss of prestress is 15 percent, estimate the deflections at the following stages and compare them with permissible values according to the Indian Standard Code (IS:1343) limits:
a) Instantaneous deflection due to (prestress + self-weight)
b) Resultant maximum long term deflection allowing for loss of prestress and creep of concrete. 12M

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