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## Institute of Technology & Sciences

**Approved by AICTE & Affiliated to JNTUA, Ananthapuramu,**
**An ISO (9001-2008) Certified Institute, Near S.K.U, Itikalapalli, Ananthapuramu Dist. A.P.**

## DEPARTMENT OF CIVIL ENGINEERING

## PRESTRESSED CONCRETE

### TUTORIAL QUESTIONS

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| 1 | Explian hoyer system of prestressing with the help of neat sketches? |
| 2 | Explain Magnel system of prestressing with the help of neat sketches? |
| 3 | Explain the historical development of prestressed concrete? |
| 4 | A post tensioned bridge girder with unbounded tendons is of size 1200 mm wide by 1800 mm deep is of box section with wall thickness of 150 mm. The high tensile steel has an area of 4000 mm$^2$ and is located at an effective depth of 1600 mm. The effective prestress in steel after loss is 1000 N/mm$^2$ & effective span is 24 m. If $f_{ck}$ = 40 N/mm$^2$, $f_y$ = 1600 N/mm$^2$. Estimate the flexural strength. |
| 5 | A prestressed concrete pile is 300 mm × 300 mm in section and is provided with 40 wires of 3 mm diameter distributed uniformly over the section. Initially the wires are tensioned in prestressing beds with a total pull of 450 kN. Determine the final stress in concrete and the percentage loss of stress in the wires.<br>Take:<br>$E_S = 2.08 \times 10^5$ N/mm$^2$<br>$E_C = 3.2 \times 10^4$ N/mm$^2$<br>Creep shortening = $32 \times 10^{-6}$ mm/mm per N/mm$^2$ of stress.Total shrinkage strain = $200 \times 10^{-6}$.<br>Relaxation loss of stress in steel = 4.5 percent of the initial stress. |
| 6 | A pretensioned prestressed rectangular concrete beam of 200 mm wide and 400 mm deep has an effective cover of 550 mm. If $f_{ck}$ = 30 N/mm$^2$ and $f_p$ = 1700 N/mm$^2$ and the area of prestressing steel $A_{st}$ = 520 mm$^2$, calculate the ultimate flexural strength of the section using codal provisions |

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| 7 | A PSC beam of rectangular section 300 mm wide and 600 mm deep is pre stressed by a parabolic cable located at an eccentricity of 120 mm at mid span and zero at the supports. If the beam has a span of 10 m and carries a uniformly distributed live load of 8 kN/m, design the shear reinforcement at the supports and quarter span section. Grade of concrete is M40. Yield stress of tendons is 2000 MPa. Area of the tendons is 1000 $mm^2$. Effective stress in the tendons is 1500 MPa. |
| 8 | The support section of a prestressed concrete beam, 100 mm wide by 250 mm deep, is required to support an ultimate shear force of 80 kN. The compressive prestress at the centroidal axis is 5 $N/mm^2$. The characteristic cube strength of concrete is 40 $N/mm^2$. The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of stirrups is 415 $N/mm^2$, design suitable shear reinforcements in the section using IS code recommendations.. |
| 9 | A concrete beam having a rectangular section 100 × 300 mm is prestressed by a parabolic cable with an initial prestressing force of 240 kN. The cable has an eccentricity of 50 mm at the centre and concentric at the supports. If the span of the beam is 12 m and subjected to a live load of 5 kN/m. Calculate the short term deflection at midspan. Assume $E_C$ = 38 $kN/mm^2$, Creep coefficient = 2, Loss of prestress = 20%. Estimate the long-term deflection. |
| 10 | A PSC beam of rectangular section 120 mm wide and 300 mm deep spans over 6 m. The beam is prestressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. If it supports an imposed load of 4 kN/m and modulus of elasticity of concrete is 38 $kN/mm^2$, compute the upward deflection under prestress and self weight |
| 11 | Explain in detail about the factors influencing short term deflections of prestressed concrete members. |
| 12 | Discuss in detail about importance of control of deflection in prestressed concrete beams. |
| 13 | Explain the importance of differential shrinkage in composite sections. |