

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume any suitable data if needed.

Q1. Fig.1 shows the cross section of the precast concrete slab unit for a bridge floor. Each slab unit is supported at 10m intervals. The slab unit is subjected to prestressing force of 375kN applied at 45mm from soffit. Determine the extreme stresses in concrete slab for mid span section i) at transfer ii) at service condition. Live load is 5.75kN/m. [CO2] (6)

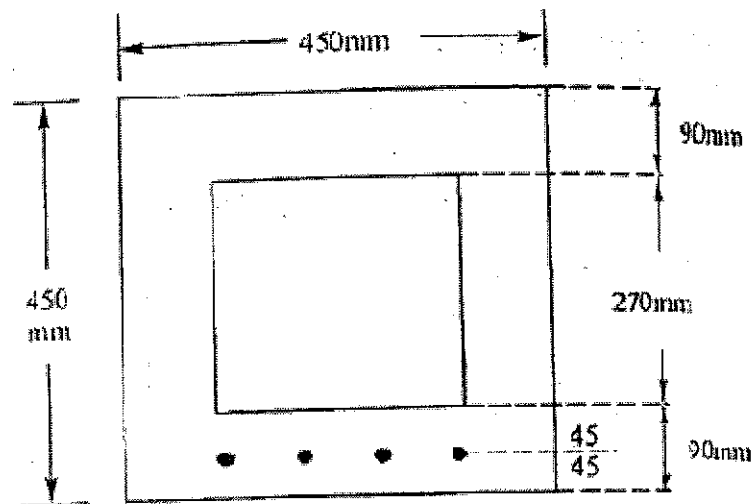


Fig. 1

Q2. Design a prestressed concrete I beam to the following requirements: [CO4] (7)

Span= 15m, live load=34kN/m, $f_{ck} = 35\text{kN/mm}^2$, Safe stress in concrete at transfer= $0.5f_{ck}$, Safe stress in concrete at service= $0.4f_{ck}$, total loss= 20%, allowable tensile stress in concrete = $0.219\sqrt{f_{ck}}$, ultimate stress in steel = 1500N/mm^2 and safe stress in steel =60% of ultimate stress.

Q3. A cable profile for a two span continuous beam is shown in Fig 2, prestressing force being 1200kN. Locate the pressure line due to prestressing force alone. [CO5] (7)

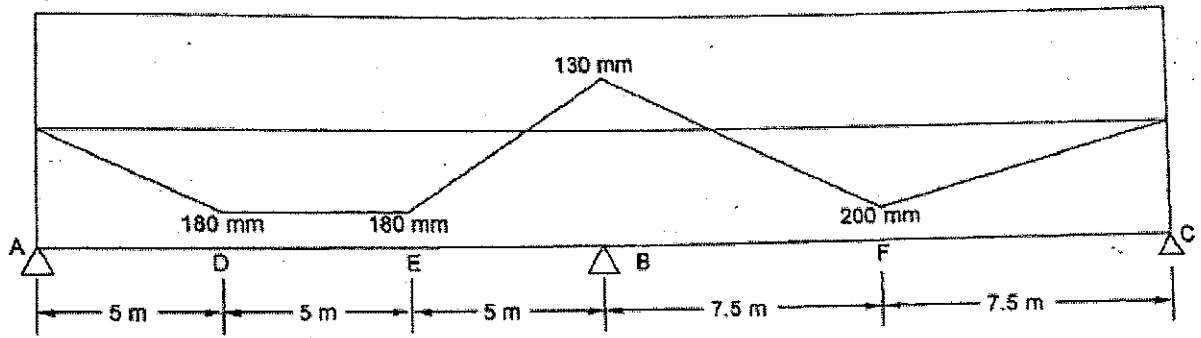


Fig. 2

Q4. A post tensioned prestressed concrete beam 16m span is subjected to an initial prestress of 1458kN transferred at 28 days strength of concrete. Profile of the cable is parabolic with maximum eccentricity of 520mm at the center of the span. Following additional data is provided

$A = 2.42 \times 10^5 \text{ mm}^2$; $I = 5.30 \times 10^{10} \text{ mm}^4$; $A_s = 1386 \text{ mm}^2$; $f_s = 1059 \text{ N/mm}^2$ at transfer

$E = 2.1 \times 10^5 \text{ N/mm}^2$; $E_c = 0.382 \times 10^5 \text{ N/mm}^2$; $\mu = 0.25$; $k = 0.0015/\text{m}$; anchorage slip = 2.5mm

Determine all types of losses. Also determine the effect of strain due to flexure caused by an external load 30kN/m acting on the beam on losses. Jacking is done from both the ends. Estimate net loss of prestress. Unit weight of concrete = 24kN/m³ [CO2,CO3] (6)

Q5. How prestressed concrete beams are different from reinforced concrete beams? Explain different systems of prestressing. [CO1] (5)

Q6. Fig.3 shows a prestressed concrete beam of I section of span 7.5m. The cable carries a prestressing force of 950kN. Determine the initial deflection at mid span due to prestress and dead load of the beam. $E_c = 35 \text{ N/mm}^2$. [CO4] (4)

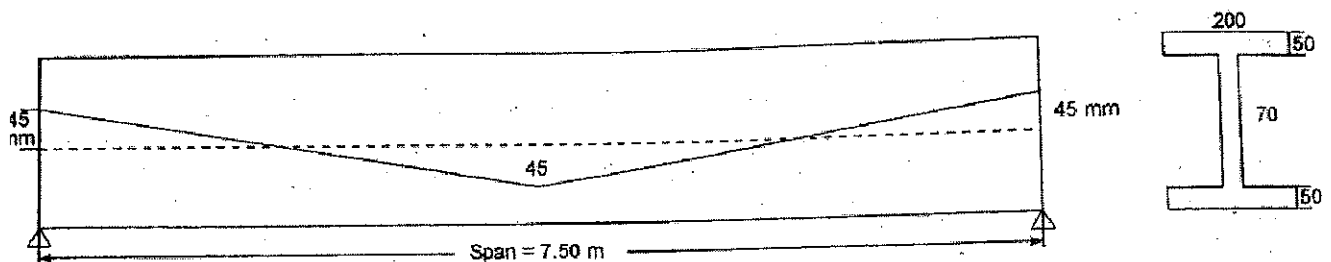


Fig. 3