EL-Mansoura University	الورقه الأولى	**Prestressed concreteSt.**
Faculty of Engineering		**Msc. degree Exam.**
Structural Eng. Dep.	**10 / 9/ 2013**	**Time : 3 hours**

Question (1)30 % الإمتحان مكون من ٣ ورقات

The shown in the Fig.(1) is to be post tensioned prestressed concrete simple beam with span 25 ms,. When the concrete is at age 28 days .Jacking will be at one end only , and it has been determined by test that slip 2.5 mm can be expected at anchorage .

Data:

$E_c = 2.8 * 10^5$ kg / cm^2 $E_p = 1.9 * 10^6$ kg / cm^2

$f_c = 400$ kg /cm^2 $f_{PY} / f_{pu} = 17/20$ t / cm^2 $K = 0.0017$ $\mu=0.25$

Creep Coefficient $\Phi = 1.6$ Shrinkage Coefficient $\varepsilon_{sh}=0.36*10^{-3}$

It is required to :

1- Find the allowable initial prestressing force Fo ?.

2- Find the required area of prestressing steel.

3- Fined the separate contribution to the losses of prestressing force at the end of a five years period . During which the sustained load may be taken equal to the self-weight of the beam.

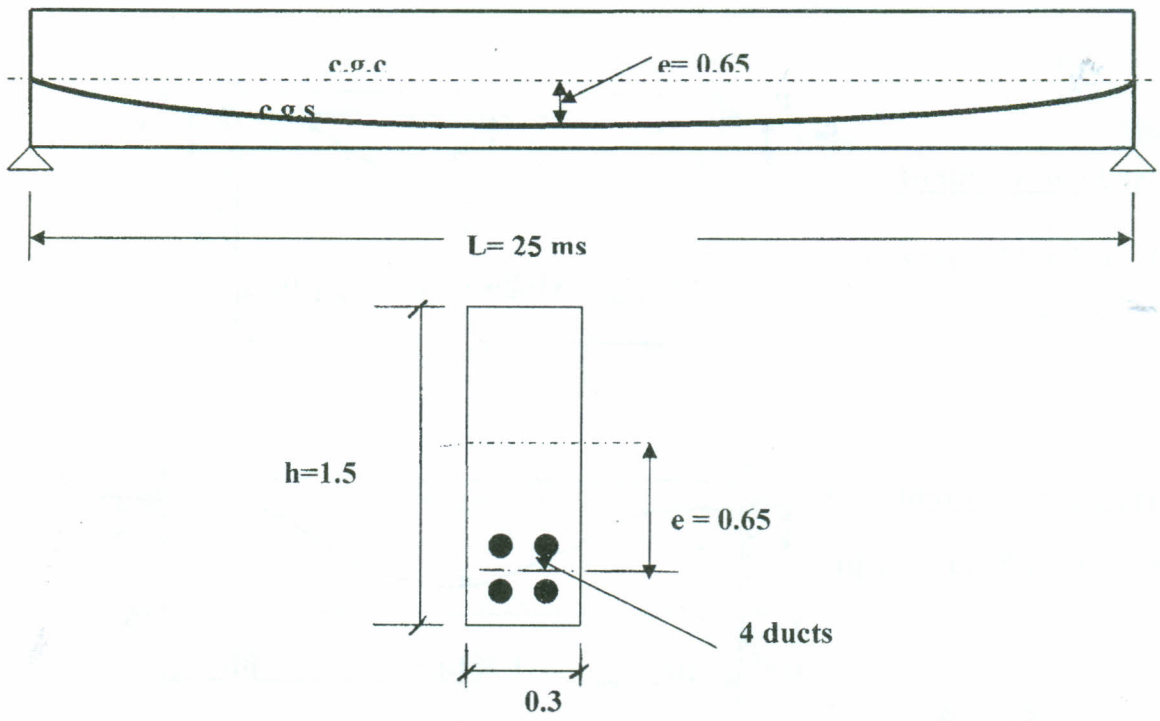


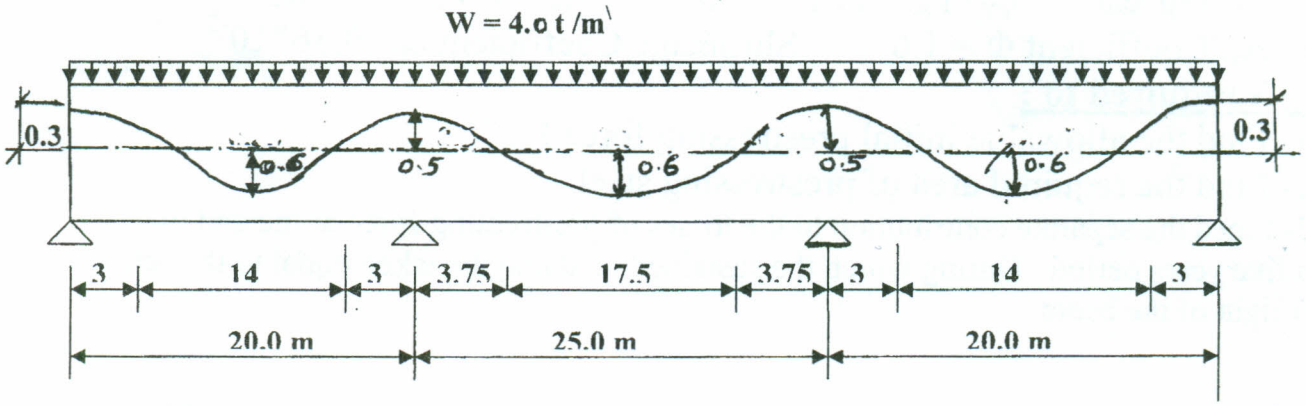
Fig. (1) **Section at mid-span**

Problem (2) 30%

The following fig. (2) shows a prestressed concrete beam ABCD of uniform rectangular cross- section .It is carries the dead load includes own weight g = 2 t/m\
f_{cu} = 400 kg/cm^2 , area of cross-section A = 0.45 m^2 & $Z_{top} = Z_{bott}$ = 0.1125 m^3
& Live load p = 2.0 t /m\ losses = 15 %

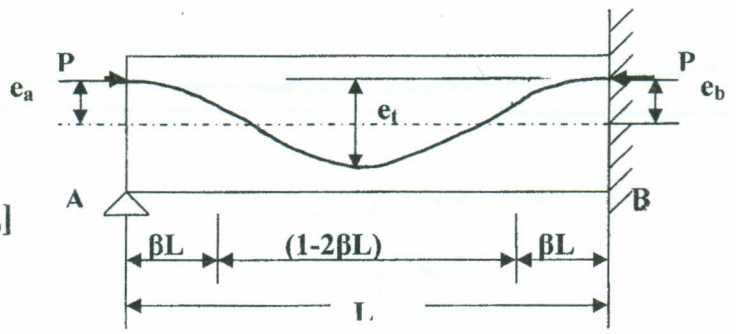
It is required to :

1)Find the initial prestressing force Fo and bending moment due to Fo..
2)Determine the absolute bending moments due to (F∞+g+p) in working stage .
3) Check the normal stresses at the critical sections for beam in the final stage.



Fixed end moment

M_B=0.5 P [2e_t(1-β) +e_b]



Fixed end moment

$M_A = M_B = (2/3)\ P\ e_t\ (1-\beta)$

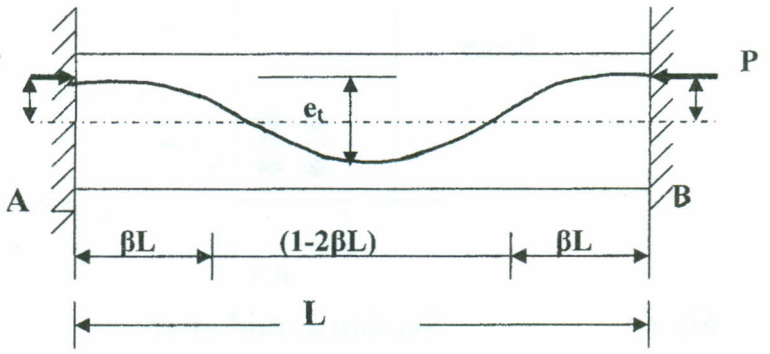


Fig. 2

Problem (3) – 40%

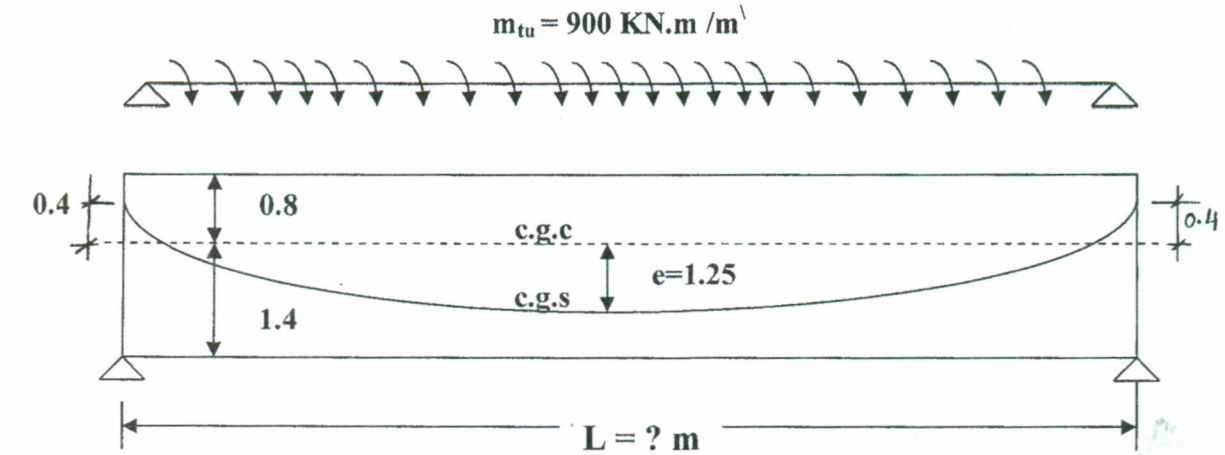
A longitudinal section and a cross-section of a prestressed concrete bridge are shown in Fig. 3.The bridge carries in addition to the own weight a factored live load = 200 KN/m\ and the initial prestressing force Fo = 4100 ton (41000 KN) and factored torsion moment (m_{tu}=900 KN.m/m\ ) losses = 15 %.

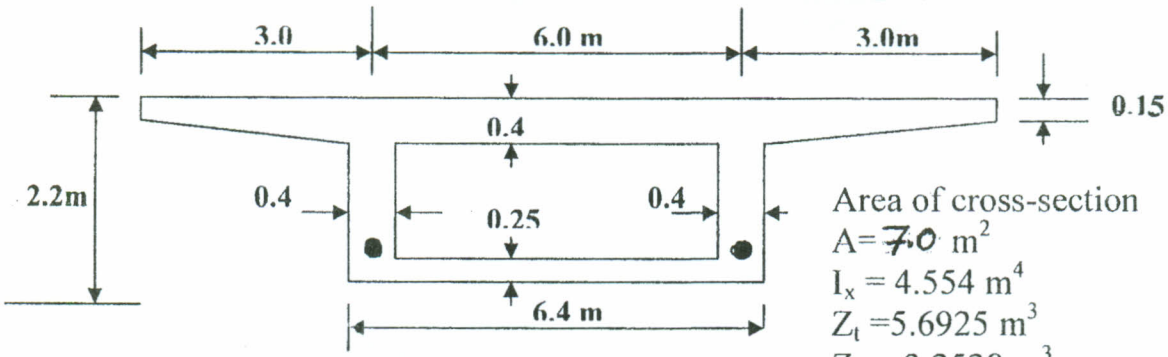
Data :

f_{cu} = 400 kg/cm^2 f_{ci} = 15.3 N/mm^2 (153 kg /cm^2) f_{ti} = 1.28 N/mm^2 (12.8 kg/cm^2)
For prestressing steel f_{py} /f_{pu} = 17 / 20 t / cm^2& f_{pe} = 1080 N/mm^2, f_{yst} = f_{yL} = 400 N/mm^2.

It is required to:

1- Find the maximum allowable span L = ? from the case of initial stage.
2-Draw S.F.D and T.M.D for beam and carry out a design for the combined shear and torsion for the critical section at 1.5 m from the support.





Area of cross-section
A= 7.0 m^2
I_x = 4.554 m^4
Z_t =5.6925 m^3
Z_b = 3.2528 m^3

Section at mid-span

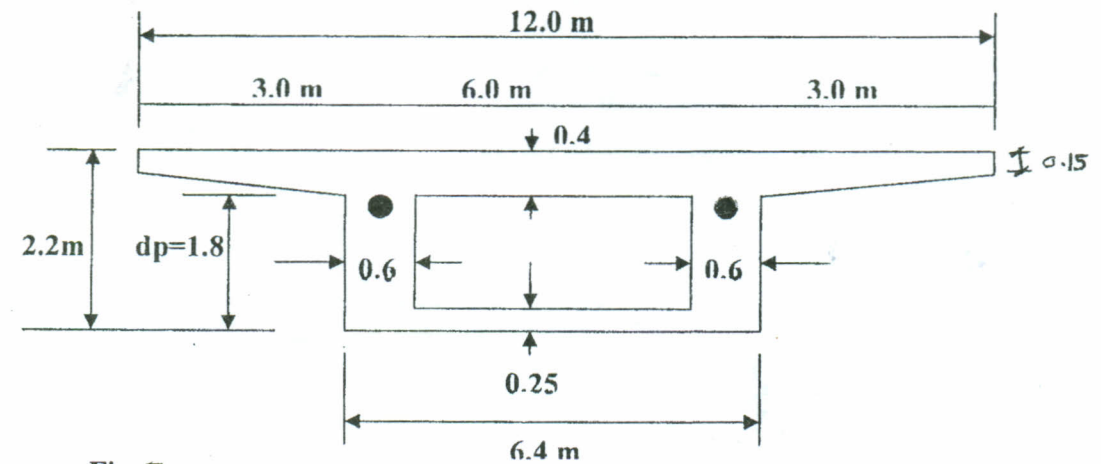


Fig. 3

Section near the support

Good Luck
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