د/ محمد نجيب — نظرية إنشاءات — مدرس

KAFR EL-SHEIKH UNIVERSITY
FACULTY OF ENGINEERING
CIVIL ENG. DEPTM.
FINAL EXAM.

10/1/2018

Professor Doctor: Mohamed Naguib Abou Elsaad

THEORY OF STRUCTURES
THIRD YEAR CIVIL
TIME ALLOWED: 4 HOURS.

MAXIMUM CREDIT 125 POINTS

Question 1: 20 points

For the frame shown in Fig.(1), draw the final bending diagram , using slope deflection method.
take into consideration that:

$M_{ac} = -23.88$ t.m

$M_{ab} = 19.92$ t.m

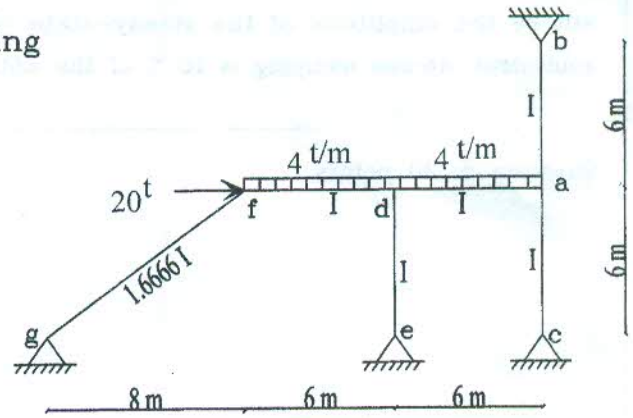


Fig.(1)

Question 1: 20 points

For the beam shown in Fig.(2), and using the moment distribution method, compute and draw the final B.M.D and S.F.D.

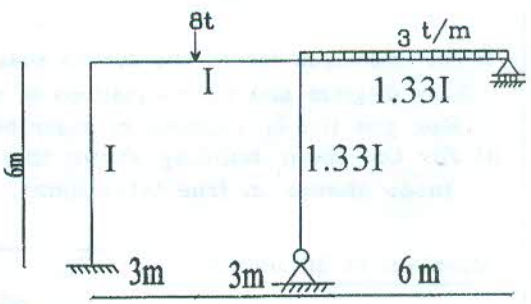


Fig.(2)

Question 3: 30(15+15) points

3-1 For the three beams shown in Figs.(3a),(3b) , and (3c) Compute the period of vibrations and then, compute the displacement , velocity , and acceleration at time t= 2 seconds. Take yo = 2cm and vo = 15 cm/sec.

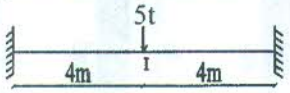


Fig.(3a)

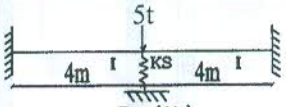


Fig.(3b)

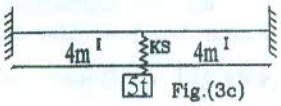


Fig.(3c)

E = 200 t/cm^2 , I = 0.0025 m^4 , KS = 10 t/cm

3-2) Find the period of vibration for the the frame shown in Fig.(4), and then with initial displacement 0f 2 cm and initial velocity of 20cm/sec. Find the displacements, velocity , and accelerations at t= 1, and 2 seconds. E= 2000 t/cm^2
I = 0,005 m^4 , and KS1 = 2000 t/m.

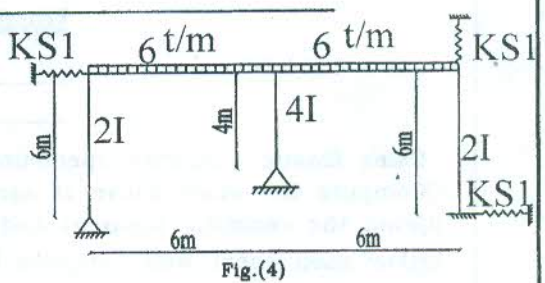


Fig.(4)

Question 4: (15) points

i-A cantilever beam shown in Fig.(5), supports at end B , a machine having a weight of 20 tons.

The motor runs at 360 rpm (round per minute) and its rotor is out of balance to the extent of w' = 0.02 ton at a radius of eo= 50 cm . What will be the amplitude of the steady-state response if the equivalent viscous damping is 10 % of the critical.

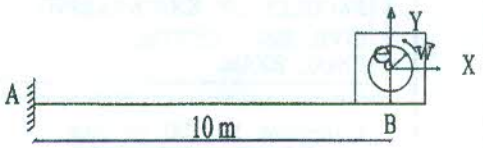


Fig.(5)

$I = 0.001\ m^4$ $E = 2000\ t/cm^2$

Question 5: 20 points

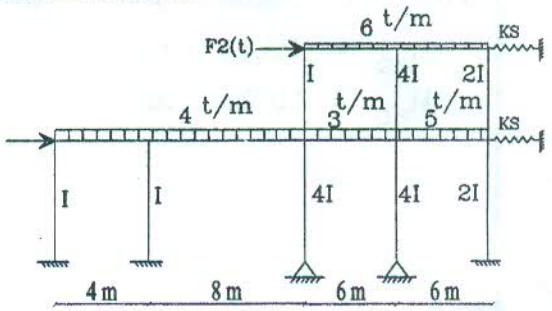


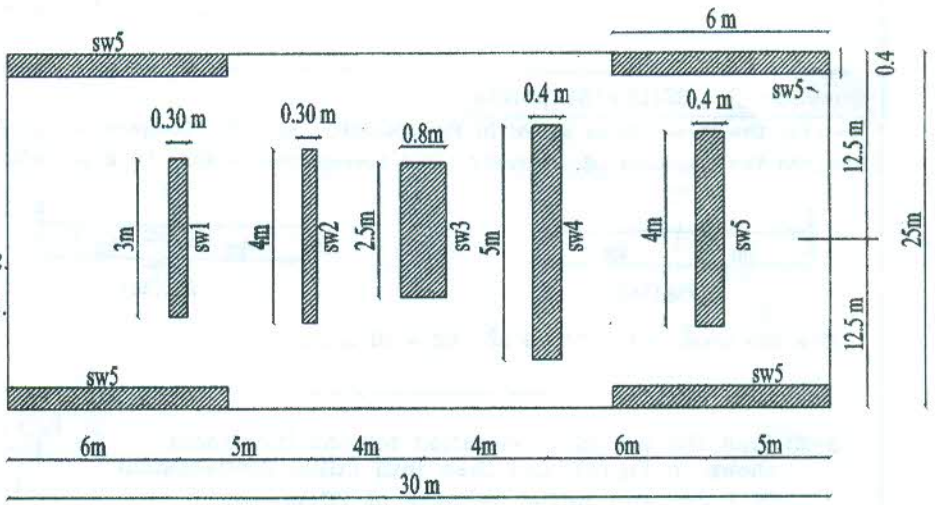
Fig.(6)

i) For undamped forced two stories shear bulding sketch both mathemitical model and the free body diagram and write equations of motions and then find the eigenproblem equation. Also, give the assumptions of shear building.

ii) For the shear building shown in Fig. (6) , compute: The natural frequency and corresponding mode shapes in free vibrations , verfying the ortogonality conditions.

Question 6: 20 points

* Number of stories = 12
* Height of each story= 3 m.
* Types of slabs is flat with 24 cm thickness.
* Live Load = 500 kg/m2.
* Weight of floor= 200 kg/m2.
* Weight of walls= 400 kg/m2.



Using Elastic Response Spectrum :

i)Compute the story shear at each floor level and draw its distribution along the height.

ii)Find the resisting moment and over turning moment at base level and then, factor of safety

iii)For each shear wall compute the bending moment at foundation level and at seventh floors.

* consider second zone for Republic of Egypt a = 0.125 g (where g= 9.81 m/ s^2)
* soil class type D with S=1.8, T_B =0.1 ,T =0.3 ,T_D =1.2 ,R =4.5 and η = 0.95
* $sd(T1) = a_g\ S\ \{\frac{2.5\eta}{R}\}\ [T_C / T_1]$