ELMANSOURA UNIVERSITY	ANALYSIS OF STRUCTURES BY COMPUTER.
FACULTY OF ENGINEERING	TIME ALLOWED ; 2 HOURS
DEPARTMENT OF STRUCTURAL ENGINEERING	FULL MARK = 50 POINTS
OPTIONAL COURSE (3)	ACADEMIC NUMBER : 8425
FIRST TERM EXAM. DATE: JUNE 2013	PROF.DR. MOHAMED NAGUIB ABOU EL SAAD

any data missing may be assumed — maximum credit 50 points

Question 1: 4+3+8+3= 18 points

i) Discuss the buckling length for all types of columns and write the second and fourth order differential equations for calculating the Euler loads , and then write their general solutions and the the boundary condition required for constant intergation for all cases.

ii) For both pin-ended column and using the second order differential equations find the buckling load.

B.F.I.B 28
IX = 20720 cm2
IY = 7320 cm2
A = 144 cm2

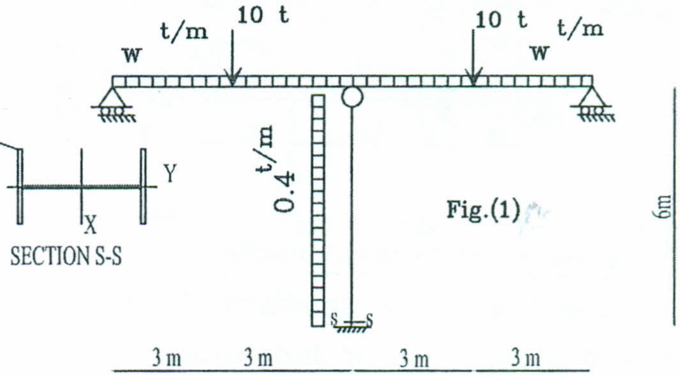

Fig.(1)

iii) Find the load P to take the buckling into consideration if the section of column at section s-s is B.F.I.B.28 . IF you returned the section of column 90 degree , what will happen

vi) For the frame shown in Fig.(2), write the determinant required to compute the critical load.

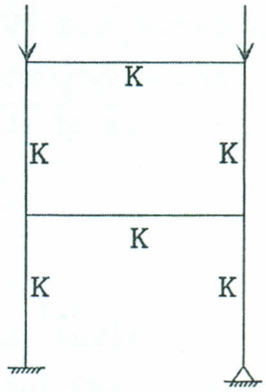

Fig.(2)

Question 2: (6+5)Points.

The FORTRAN program used in the analysis of beams with source name kafr2013.FOR consists of main program and number of subroutines using the stiffness method. The following subroutine beam is used for input data:

```
SUBROUTINE BEAM
COMMON/C1/----
READ(30,*)NM,NJ,ND,NLM,NLJ,IWRT,NT,NSPRING,IDATA,IBOND,EA
READ(30,*)(MN(I),J(I),K(I),QIX(I),I=1,NM)
READ(30,*)(XC(I),I=1,NJ)
READ(30,*)(ID(I),I=1,NT)
IF(NSPRING.NE.0)READ(30,*)(QSP(I),I=1,ND)
IF(IBOND.EQ.1)READ(30,*)(QBP(I),I=1,NT)
IF(NLM.GT.0)READ(30,*)(I,P(I,J1),J1=1,MM),L=1,NLM)
IF(NLJ.GT.0)READ(30,*)(I,PL(I,J1),J1=1,NN),L=1,NLJ)
RETURN
END
```

REQUIRED:

i) Write step by step analysis and name of subroutines and their jobs.

ii) For the beam shown in Fig.(2), write data file and give the dimension of matrices [K11], [K12], [K21], and [K22]. E = 2000 t/cm2 , I = 0.0001 m4 , and ks = 2000 t/m

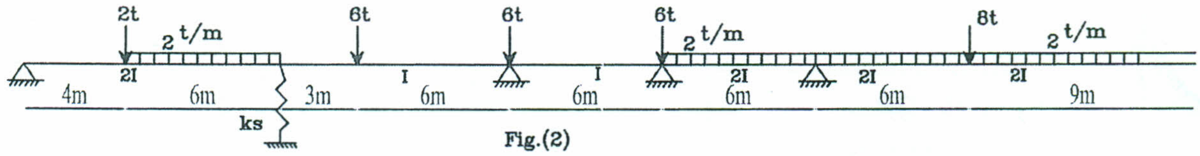

Fig.(2)

Question 3: 3+2+4+4 Points.

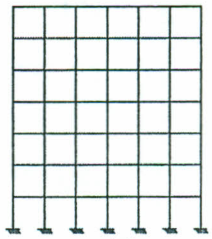
Fig.(3)

i) For the frame shown in Fig.(3) give the number of static and kinematics of indeterminacy and if you used the banded matrix technique, give the percentage reduction.

ii) What is the difference between plane frame and grid.

iii) Write briefly about : force and displacement methods of analysis, sub-structures, types of finite elements, and P-delta effect.

vi) Discus and sketch without calculation the independent mechanisms and write the static equations for the frame shown in Fig.(4) in plastic analysis of structures.

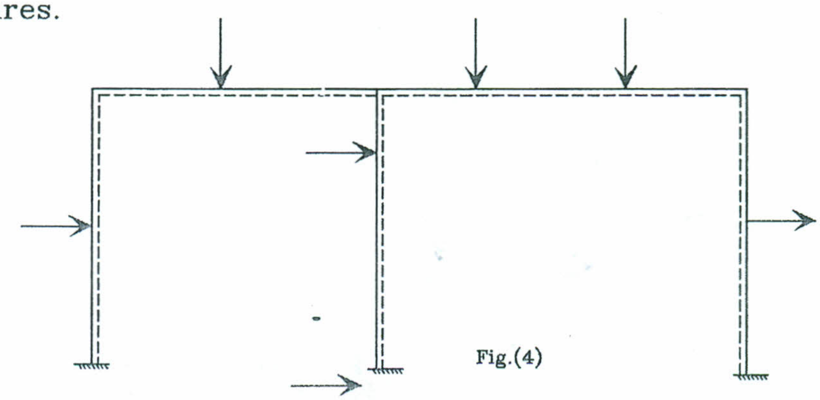
Fig.(4)

Question 4: 3+5+8 Points.

1) Find the period of vibration for the frame shown in Fig.(5):

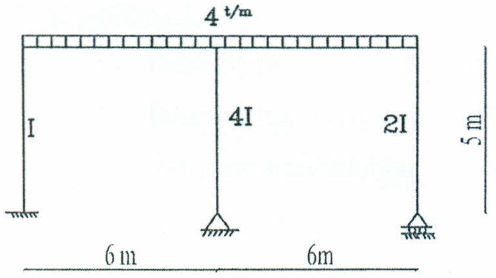

Fig.(5)

E= 2000 t/cm2 , I = 0.0005 m4. , and ks = 1000 t/m

E= 2000 t/cm2 , I = 0.0005 m4.

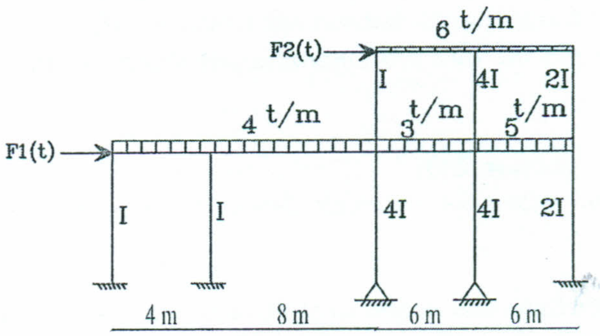

Fig.(6)

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

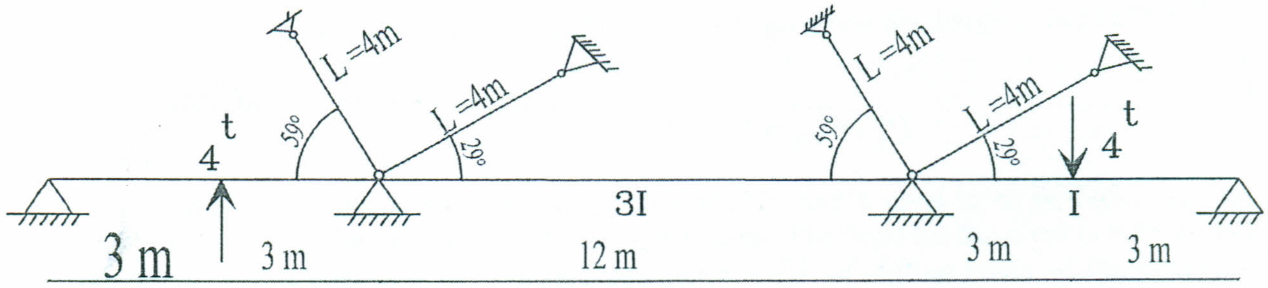

Fig.(7)

3)For the trussed beam shown in Fig.(7), give a complete analysis using the stiffness method. E = 2000 t/cm2 , I = 0.005 m4 and the area for all truss members = 20 cm2.

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