Benha University
Civil Engineering Department
January 2010

Faculty of Engineering (Shoubra)
Fourth Year Civil – Public Works Div.
January Examination

ELECTIVE COURSE - COMPUTER APPLICATIONS

Time all. = 3.00 Hrs **Total Marks = 70**

Systematic arrangement of calculations and clear neat drawings are essential. Any data not given can be reasonably assumed according to the Egyptian Code of Practice.

Question (1): (10%)

(a) Use clear sketch to show the use of end-offset and state its importance.

(b) How the frame element can be used to analyze the trusses in **SAP2000** program.

(c) Consider that the following types of problems are needed to model using **SAP2000** program:

(1) **Plane Frame** (2) **2D-Truss** (in one plane) (3) **Raft** on springs

For each of the above cases explain (using sketches when appropriate) the following:

- Default plane (or planes) of work and available degrees of freedom.
- Types of elements involved.
- Data blocks or items that have to be defined to complete the analysis.

Question (2) : (30%)

It is required for the RC Frame shown in Figure (1):

(a) Write the steps to explaining how to complete the modelling of the structure using **SAP2000** program.

(b) Draw the Bending Moment, Shear Force and Normal Force diagrams.

(c) Investigate the cross-section (**I - I**) is able to carry the external bending moment.

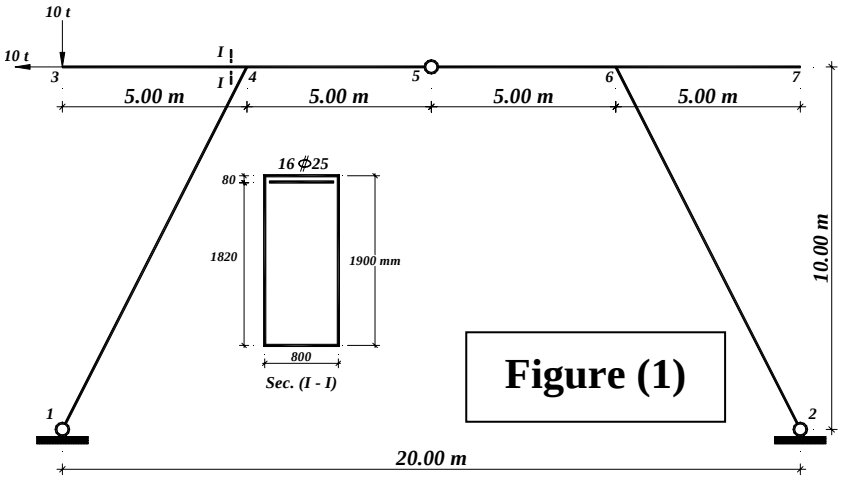

Figure (1)

Note: The materials properties are, f_{cu} = 25 N/mm^2, f_y = 360 N/mm^2, f_y (stirrup) = 240 N/mm^2.

Question (3) : (35%)

It is required for the steel truss shown in Figure (2):

(1) Write the steps to explaining how to complete the modelling of the structure using **SAP2000** program.

(2) Calculate the forces in the marked members.

(3) If the allowable stress for the steel members is ($\sigma_{all.Compressipn} = 0.90\ t/cm^2$ & $\sigma_{all.Tension} = 1.40\ t/cm^2$) and the cross-section for the truss members is angles ($2L100\times10$) & ($Area_{sec.} = 38.40\ cm^2$). Check the safety of the marked members.

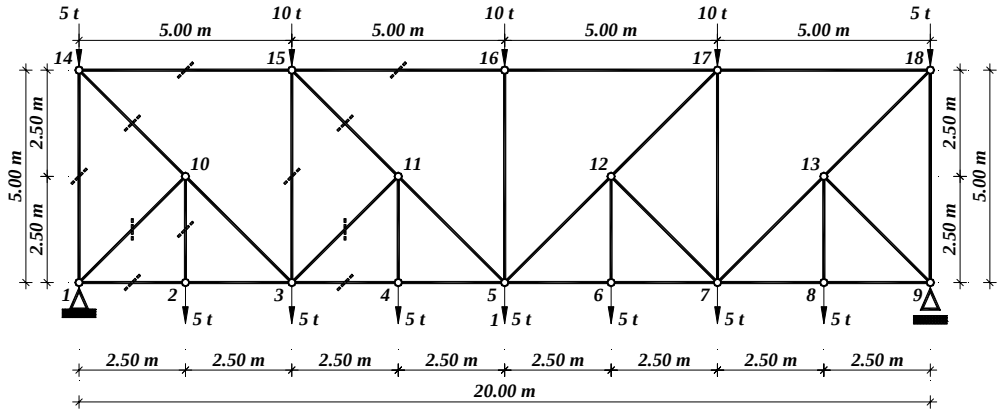

Figure (2)

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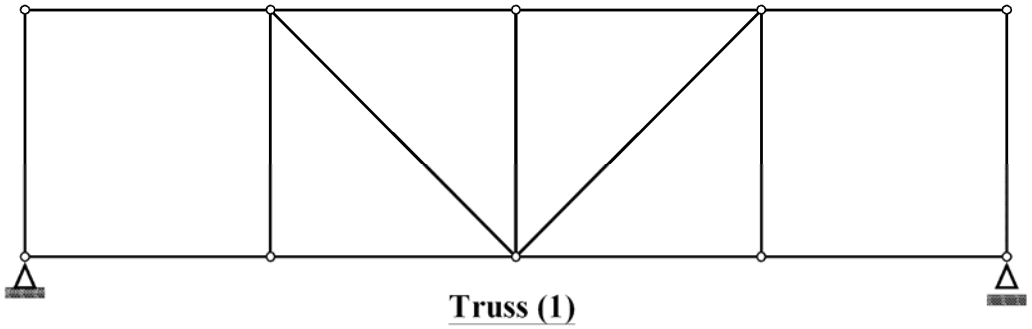
Question (4): (25%)

Figure (3) shows a vertical cross section in one of a series of trusses spaced at 6.0m and supporting a roof covering an area ($20.0m \times 48.0m$) of a factory. There are three hinged frames suggested to be used.

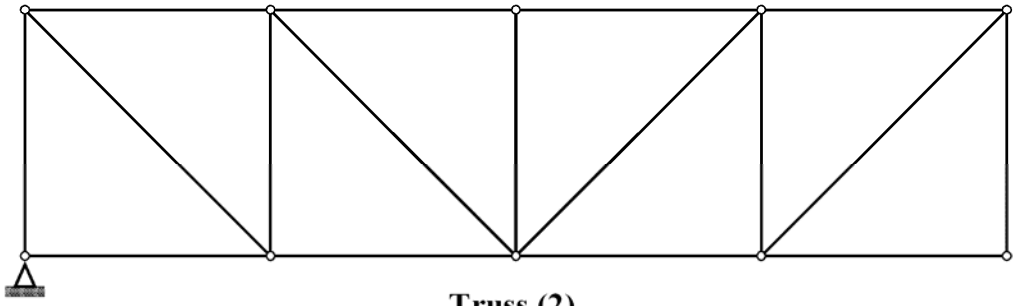
It is required for the shown trusses in Figure (3):

(1) Discuss and find what is the problem and the defect for each truss which has been used as a computer model.

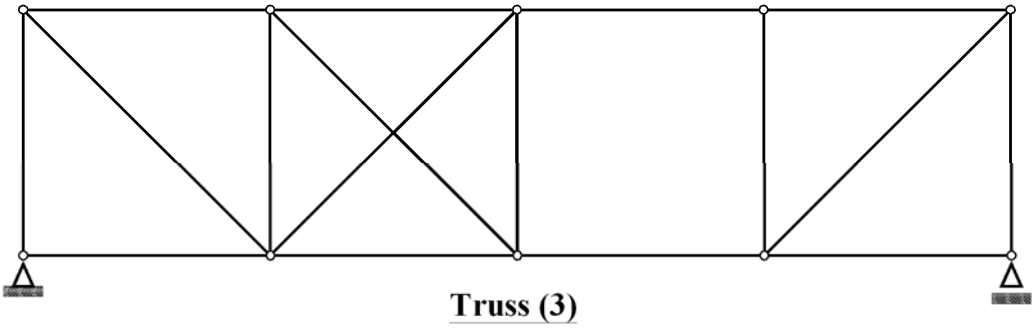
(2) Choose one truss and correct its model to be used safely to cover the roof.



Truss (1)



Truss (2)



Truss (3)

Figure (3)