Kafrelsheikh University
Faculty of Engineering
Department of Civil Engineering
3rd year, Design of Steel Structures
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Date: 02 – 01 - 2019
Time allowed: (3) hours
Full Mark: 70
Final Exam: 2 pages
Academic Number: CES3010

Notes: - Assume any missing data reasonably.
    - <u>Only Egyptian code for steel structures and steel tables are allowed.</u>
    - Unless otherwise noted, steel used is <u>St. 44</u>.

1- a- The truss shown in Fig. (1) is used to cover an area in Kafrelsheikh city (36.60x24.00). The spacing between trusses is 6.10 m. the roof covering is sandwich panels of weight 18 kg/m^2 (inaccessible roof). The own weight of the steel skeleton can be assumed to be 40 kg/m^2. It is required to: [ILOS a.4, a.6, a.13,b.15]

- Draw a general layout of the building (roof plan, main system elevation and side view) showing the arrangement of all bracing systems. Use a scale of 1:200.
- Calculate the loads at each joint of the truss due to dead load, live load and wind load from left to right (live load and wind load are according to Egyptian code requirements).
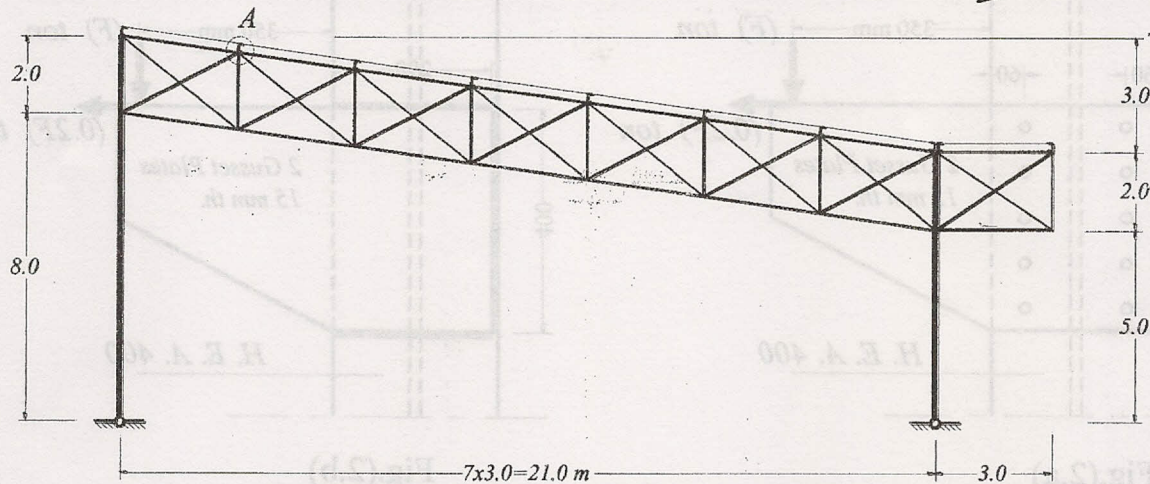- Using channel section, design simply supported purlin at joint (A). Using one tie rod system.

Fig.(1)   (24 Marks)

b - If the forces in the following members (given in the table below) due to different cases of loading, find the design forces for these members. [ILOS a.6, a.13]

member	Dead Load	Live Load	Crane Left			Crane Right			Wind Load	
			V	HR	HL	V	HR	HL	Left	Right
A	+19	+10	-8	-3	+2	+7	+4	-4	-8	+4
B	-14	-6	-4	+2	-2	+3	-1	+1	+6	-5

(6 Marks)

c – Choose a suitable cross section for the following members according to the following data. Assume bolted connection with bolts 16 mm diameter. [ILOS a.6, b.15]

Member	Force (ton)	Length (m)	shape
1	+28 (case I)	5.30	Two angles b. to b.
2	-14 (case II)	4.70	One angle
3	zero	5.10	Star shape

(14 Marks)

d – Find the maximum compressive force (Case II) of a member composed of two angles back to back 100x100x10 if $L_{bx} = 3.0$ m & $L_{by} = 4.0$ m assuming welded connection. [Use steel 44]. [ILOS a.6, b.15]

(6 Marks)

2- For each one of the bracket connections shown in Figs. (2.a) & (2.b), the two gusset plates are 15 mm thickness and the column is H.E.A. No. 400. The plates subjected to vertical and horizontal forces as shown in the figures. It is required to determine the maximum value of the force (F) that can be carried by each one of these connections as follows: [ILOS a.6, a.13, b.15]

a. The bolted connection shown in Fig. (2.a) if the used bolts are ordinary bolts 20 mm diameter with grade 5.6.

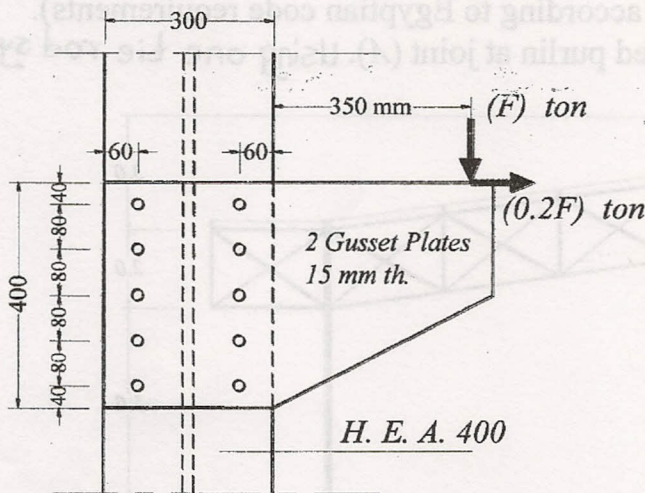b. The welded connection shown in Fig. (2.b) if the weld size (s) = 10 mm.
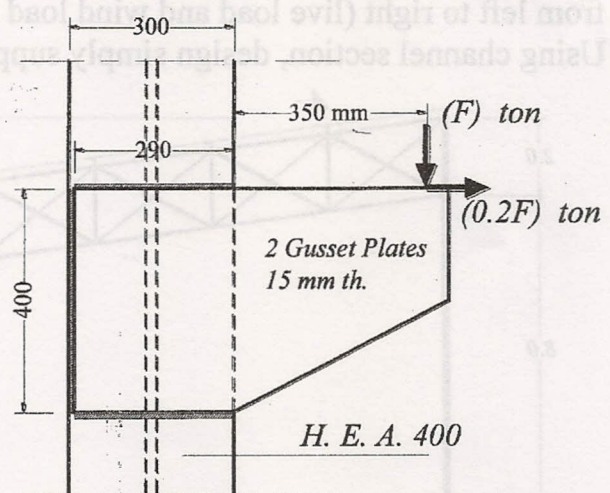

Fig.(2.a)   Fig.(2.b)

(24 Marks)