



Steel structures (CVE2112)  
2019/2020 - June 2020  
2nd Semester – Final Exam  
Take-home Exam  
Marks: 100



### نوع التقييم: بحث مرجعي

	اسم الطالب
	الرقم الأكاديمي
CVE2112 منشآت معدنية	اسم المقرر
	المستوى
تحليل وتصميم المنشآت المعدنية	عنوان البحث المرجعي

التوقيع	الدرجة	رقم السؤال
		السؤال الأول
		السؤال الثاني
		السؤال الثالث
		السؤال الرابع
		السؤال الخامس
		المجموع

### طريقة التقديم:

- على كل طالب ارسال الإجابات (بخط اليد) بصيغة pdf على البريد الإلكتروني: wamcepm2020@gmail.com
- يجب كتابة اسم الطالب على كل صفحة من صفحات البحث المرجعي.
- مع تمنياتي بالتوفيق والنجاح ،،

أ.م . د./ وليد أبو الوفا محمد + اللجنة

- . Any missing data can be reasonably assumed -
- . This exam consists of 5 problems. The total number of pages is 18 pages -

### Problem (1) (20 marks)

A factory building is to be constructed over a rectangular area of (14.4 x 26 m), **one** car shed of area (3.20x 26 m) is added from one side as shown in **Fig. 1**. The main system is steel truss. Columns are provided on the solid lines only. The height of columns is 8.0 m. The spacing between trusses is 5.2 m. Use W shape truss. A 7.2.0 m gate should be provided. Determine the different parameters of the truss system then draw to scale 1:100 a general layout (plan, main system, vertical and longitudinal bracing sections and end gable elevation).

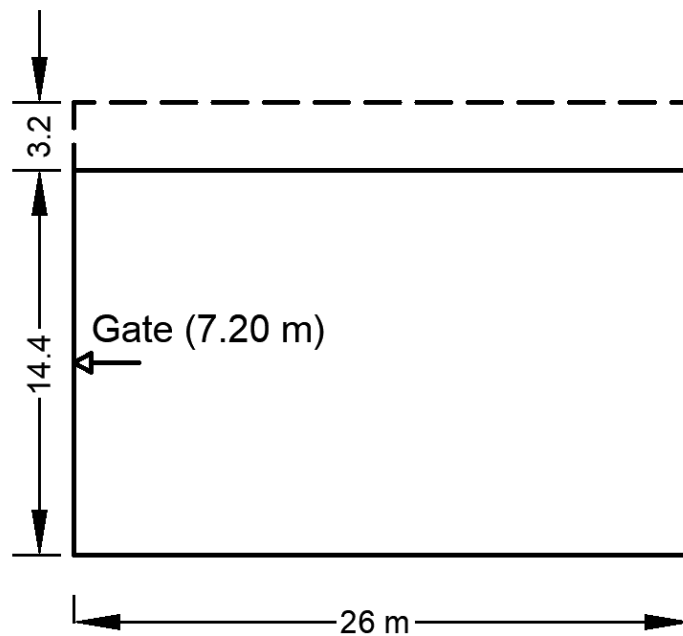


Fig. 1

### Solution of problem 1:

#### a- Calculations

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**Continue calculations:**

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**b- Plan**

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**c- Main system**

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**d- Vertical and longitudinal bracing**

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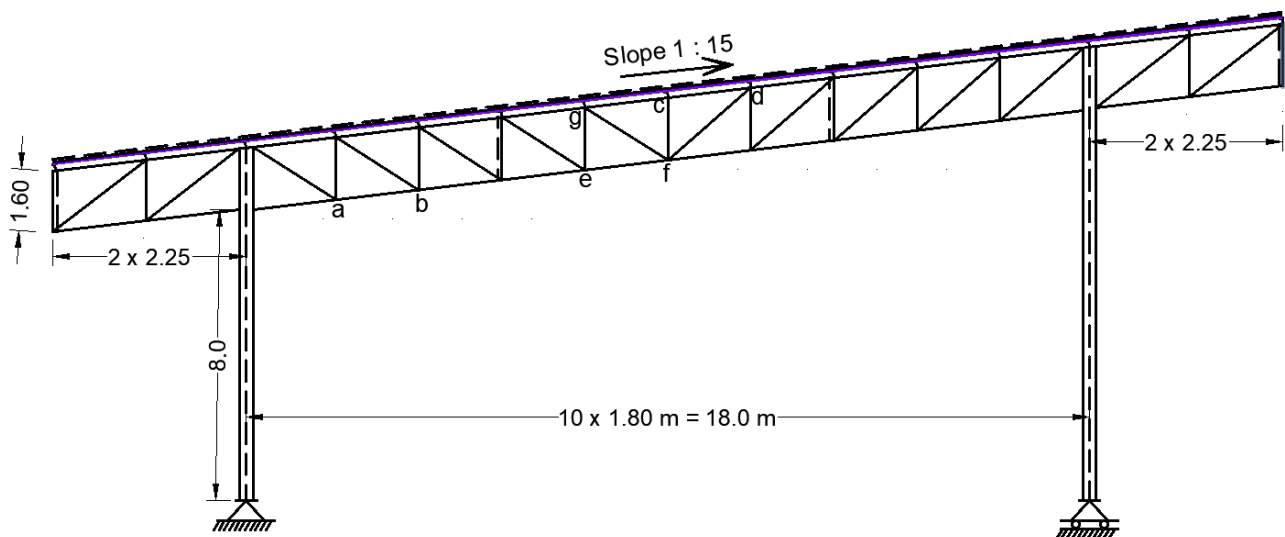
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**e- End gables**

**Problem (2) (30 marks)**

The truss system shown in **Fig. 2** is proposed to be analyzed and designed. R.C panels weighing  $125 \text{ kg/m}^2$  is used to cover the roof while corrugated sheets are used to cover the sides. Spacing between main trusses is  $8.0 \text{ m}$ . Live loads for the roof is determined according to the Egyptian code of practice (ECP) for inaccessible flexible roofs. The self-weight of the steel structure =  $25 \text{ kg/m}^2$ . The wind velocity =  $42 \text{ m/s}$ . The thickness of gusset plates is  $10 \text{ mm}$ . St. 44 is used for the steel structure. The diameter of the used bolts is  $18 \text{ mm}$ . It is required to:

- **Calculate** loads acting on an intermediate truss due to DL, LL, WR and WL (draw the different resulted loads on the main system for the different cases) .

**Fig. 2****Solution of problem 2:**



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**Problem 3 (10 marks) :**

- For the truss shown in Fig. 2 (problem 2), calculate the design force in member a-b due to DL, LL, WR and WL. (Use the data resulted in problem 2)

**Solution of problem (3)**

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**Continue Solution of problem (3)**

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**Problem (4) (20 marks)**

If the truss illustrated in problem (2), Fig. 2 is loaded in different ways. Design the following members according to the following conditions (use whatever you need from the data given in problem 2):

$F_{cd} = -14$  ton (bolted connection, case A),

$F_{ef} = +8$  ton (bolted connection, case B)

$F_{gf} = +10$  ton (welded connection, case A)

$F_{ge} = -6$  ton (bolted connection, case A)

**Solution of problem (4)**

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**Continue solution of problem (4)**

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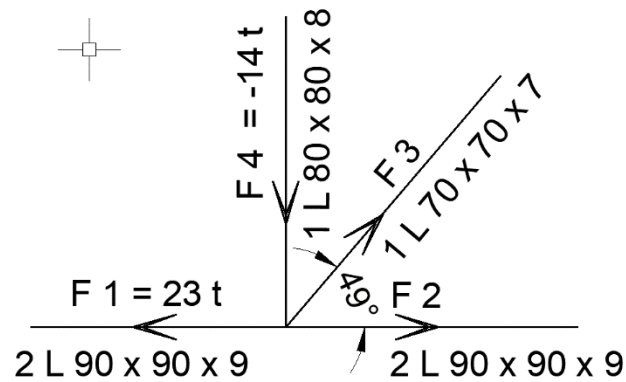
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**Continue solution of problem (4)**



**Problem 5 (20 marks)**

For the truss joint shown in Fig. 3, it is required to calculate the forces in members F2 and F3 then design the bolted connection due to primary loads (case A). Use bolts M18 grade 4.8 and gusset plate of 10 mm thickness. Draw to scale 1:10 the details of the connection. Use steel grade 44.

**Fig. 3****Solution of problem (5)**

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**Solution of problem (5)**

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**Solution of problem (5)**