Menoufia University **Faculty of Engineering** **Civil Engineering Dept.** **Semester : (I)** **Date : 10 /1 / 2018**	**Subject: Design of Rigid Steel Frames** **Code : CVE 508** **Year : 2017/2018** **Time Allowed : (3) hours** **Total Marks : 100 marks**

- **Tables of Steel Sections and Egyptian Code of Practice (ECP) are allowed.**
- **Any sketches should be neat, detailed and fully dimensioned.**
- **Any missing data may be reasonably assumed.**
- **Read carefully the given data and solve the required questions.** **(Total Marks: 100)**

Answer the following questions

Question 1: (30 Marks)

The frame **ABCDE** shown in **Figure (1)** is supported by hinged supports at **A & E**. The frame is regularly spaced at 6.0 m and the roof purlins are spaced at 1.50 m.

Given:

Weight of steel = 25 kg/m^2
Cover = 15 kg/m^2
Live Loads = To be taken for **Inaccessible rigid roof from attached Graph**
Wind Load Area Pressure (q) = 65 kg/m^2
Steel to be used = ST. 37 (F_y=2.8 t/cm^2 & F_u=4.40 t/cm^2)
Bolts used = M22
(Type (10.9), For M22, A = 3.80 cm^2, A_s = 3.03 cm^2, T_o = 19.08 t, and P_s = 6.10 t)

Required:

For the given Loads and Reactions give @ **E** it is required to:

a. Sketch with suitable scale all necessary views of the bracing system required for the stability of the structure. **[15 marks]**

b. Determine the design B.M, S.F and N.F for the frame under the given loads. **[15 marks]**

Question 2: (40 Marks)

a- Design a suitable section for the above PF column if the applied straining actions are as follows;
N= -20.0 t, M_x= 25 m.t, L_{bx}= 16.0 m, L_{by}= 4.0 m **[20 marks]**

b- Determine a suitable section for the PF rafter if the applied straining actions are as follows;
M_{Eave}= -25.0 m.t, M_{Apex}= +10.0 m.t, Purlin Spacing= 1.50 m **[20 marks]**

Question 3: (30 Marks)

a- Design the Eave joint of the PF shown in **Figure (2)** if the straining actions were as follows;
M_x= 30 m.t , Q_y= 7.50 t **[20 marks]**

b- Discuss briefly the benefits of the bracing system in the structure **[10 marks]**

With my best wishes,,,,

Dr. Maher Elabd

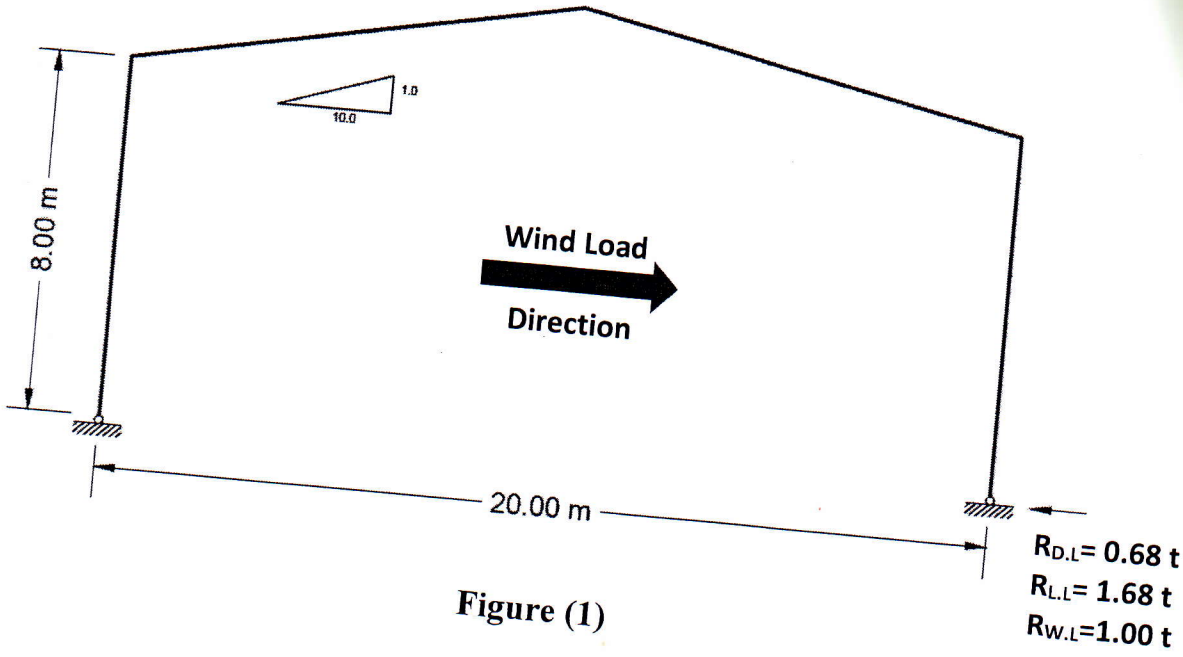

Figure (1)

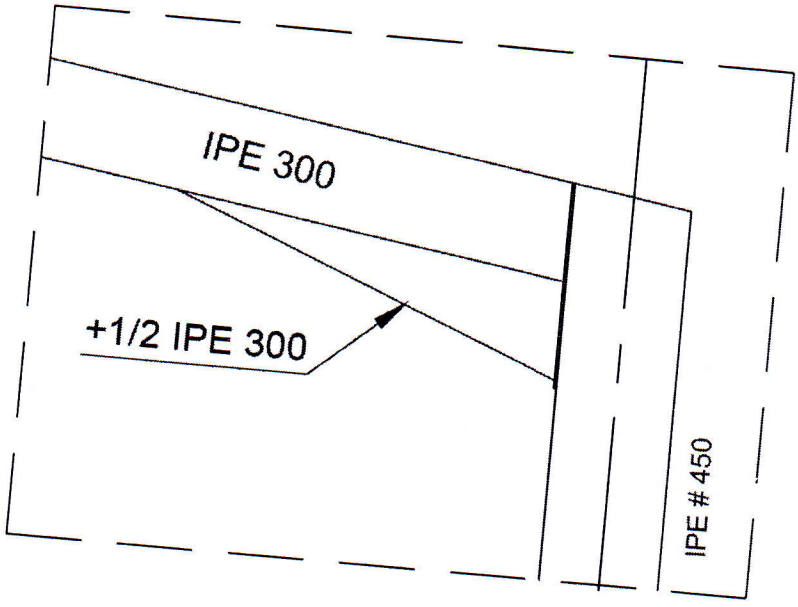

Figure (2)