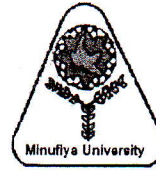


Menoufia University  
 Faculty of Engineering, Shebin El-Kom  
 Mech. Power Engineering Department  
 First Semester, Final Exam  
 Date of Exam: 23 /1/2014  
 Year: 2013 - 2014



Subject: Elective Course (3B), Design and Performance of Refrigeration and Air Conditioning Devices  
 Code: MPE 414 B  
 Time Allowed: 3 hours  
 Total Marks: 60 marks

**Note: All design tables, charts and catalogues belong to the students are allowed**

**Answer the following questions**

**Question (1)**

(5+35=40 Marks)

- With the aid of sketches, explain the consisting and theory of work of the **Electric Expansion Valve**.
- In a factory of food manufacturing and storing at Cairo, frozen chicken at  $-18\text{ }^{\circ}\text{C}$  are received to be stored, at the same temperature, in a room of inside dimensions of  $8 \times 12 \times 6\text{ m}$ . The room, which is shown in Fig. (1), lies in the second floor. All walls of the room are made of 10 cm polyurethane panel while the ceiling and the floor are made of concrete and insulated with the same insulation used for walls. Maximum storing weight in the room is 225 tons. Supply your complete design of the store.

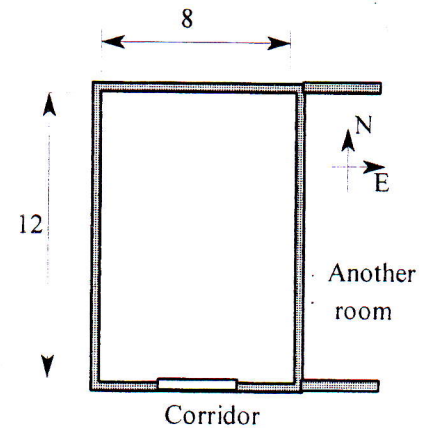


Fig. (1)

**Question (2)**

(10 Marks)

- Classify the air conditioning systems according to the heat transfer fluid that transports energy from the conditioned space to the air handling unit.
- For all air system, draw a simple diagram of single duct constant volume multiple zone air systems with brief comment and mention 3 advantages.
- Why does the variable air volume, VAV, terminal unit used in air conditioning all air system.

**Question (3)**

(10 Marks)

Air conditioned conference hall of  $15 \times 8 \times 5\text{ m}^3$  is maintained at  $22\text{ }^{\circ}\text{C}$  dbt and RH of 50%. The ambient conditions are  $35\text{ }^{\circ}\text{C}$  dbt and  $27\text{ }^{\circ}\text{C}$  wbt. The hall has total load  $Q_T = 0.04\text{ TR}/\text{m}^2$  of the hall floor area. The latent heat load is equal to 15% of the total load. The re-circulated air contains 50% by weight fresh air. The re-circulated air is supplied to the room at  $15\text{ }^{\circ}\text{C}$  dbt. Draw a sketch for this system and its representation on the psychometric chart,

and calculate the followings,

- a) The technical data of the air handling unit.
- b) Select a suitable equipment of air handling unit for *DX* cooling coil, and the capacity and power of the air fan used to discharge air against total static pressure head of 1100 Pa .

***With our best wishes.***

This exam measures the following ILOs										
Question Number	Q1-a	Q2-c	Q2	Q3	Q1-b	Q2-a	Q3	Q1-b	Q2-c	Q3
Skills	A14.5	a5-2	a14-3 a14-4	a14-5	B2.1: B2.6	B2-6	B13-2	C8-1	C5-1	C8-1
	Knowledge & Understanding Skills				Intellectual Skills			Professional Skills		