



**UNIVERSITI KUALA LUMPUR**  
**Malaysia France Institute**

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**FINAL EXAMINATION**  
**JANUARY 2014 SESSION**

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**SUBJECT CODE** : FRD 20502  
**SUBJECT TITLE** : RAC CONTROL  
**LEVEL** : DIPLOMA  
**TIME / DURATION** : **12.45pm - 2.45pm**  
( 2 HOURS )  
**DATE** : 03 JUN 2014

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read the instructions given in the question paper **CAREFULLY**.
  2. This question paper is printed on both sides of the paper.
  3. Please write your answers on the answer booklet provided.
  4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
  5. This question paper consists of **TWO (2) sections**. Section A and B. Answer **ALL** question in section A. For section B, answer **TWO (2) questions** only.
  6. Answer all questions in English.
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**THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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## SECTION A (60 MARKS)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

## Question 1

Based on Figure Q1, answer the following questions:

- (a) Name a flow control device on the refrigeration loop. (2 marks)
- (b) Explain how the functions of control device (in question a). (8 marks)
- (c) Name a temperature control device on the process loop (room air). Temperature setting  $24 \pm 0.5^\circ\text{C}$ . (2 marks)
- (d) Explain how the functions of control device (in question c). (8 marks)

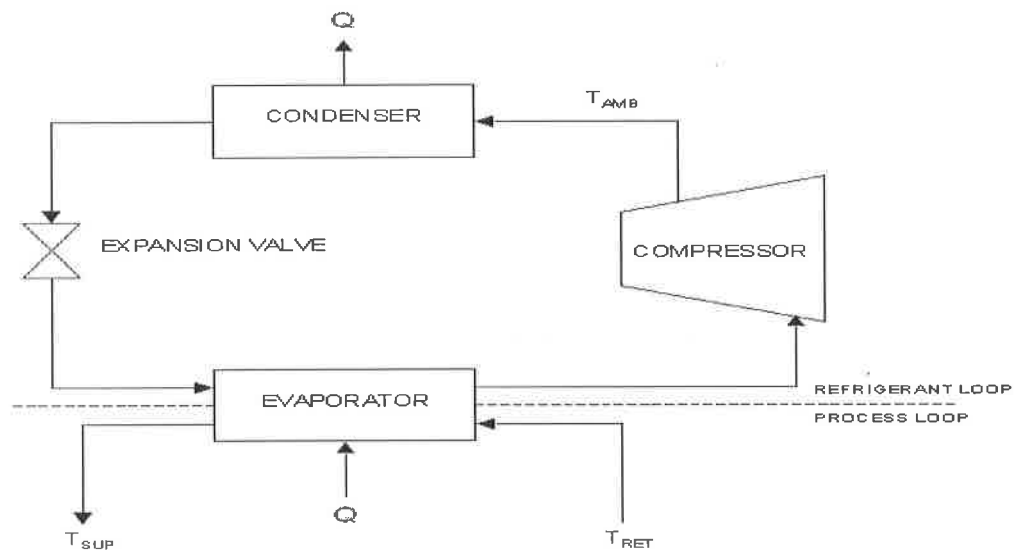
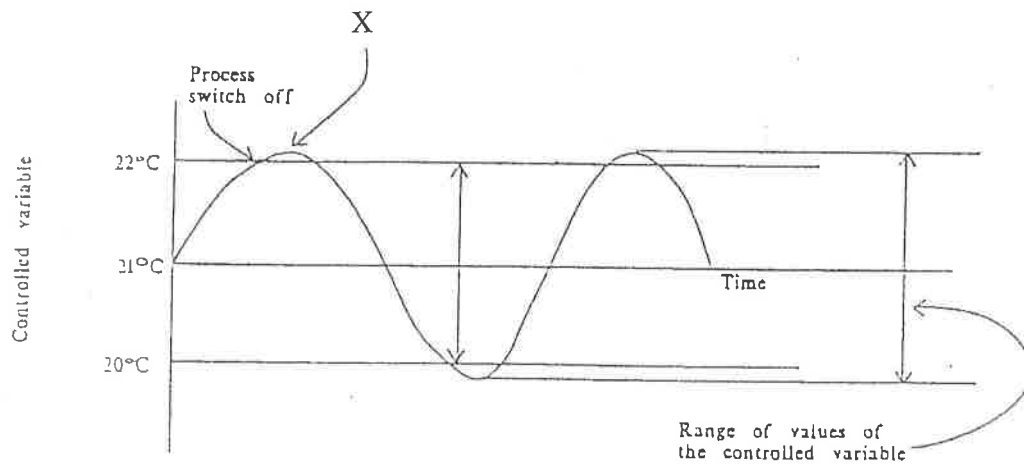


Figure Q1: Refrigeration cycle of air-cooled split air conditioner

**Question 2**

Based on Figure Q2, answer the following questions:

- (a) Name two (2) types of control mode. (2 marks)
- (b) Name the type of control mode that is represented by the curve. (2 marks)
- (c) What is the value of the set point? (2 marks)
- (d) What is the value of differential? (2 marks)
- (e) Name the item X. (2 marks)



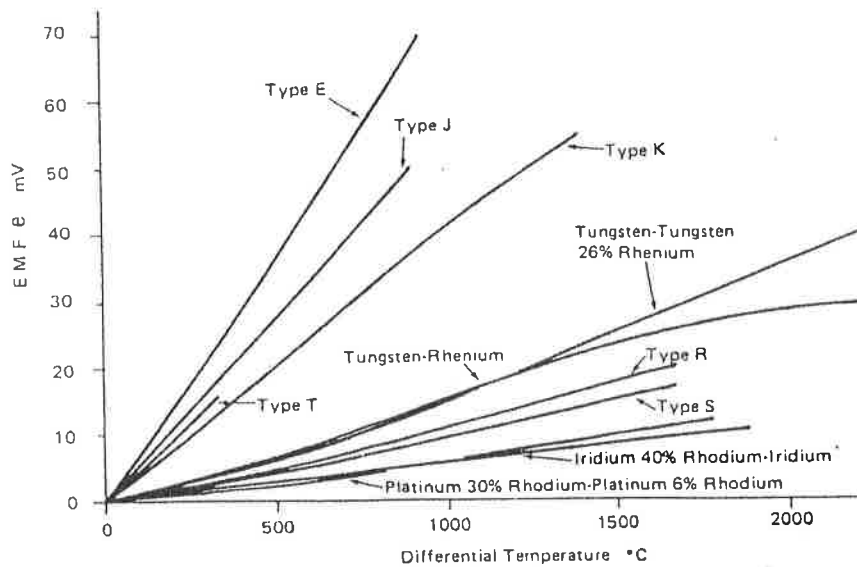
**Figure Q2:** Curve of a control mode

**Question 3**

State the function of the following control components in an air conditioning and refrigeration system.

- (a) accumulators (2 marks)
- (b) LP and HP controls (2 marks)
- (c) Oil separators (2 marks)
- (d) Receivers (2 marks)
- (e) Filter driers (2 marks)

## Question 4



**Figure Q4:** Graph of characteristic of different sensor materials

In thermometers which employed electrical transducers, temperature is converted into an electrical quantity namely resistance, current or voltage. Answer the following:

- (a) Name three (3) types of the most commonly used thermometer / sensor. (6 marks)
- (b) By referring to the calibration curve of an electrical transduction thermometer material as per **Figure Q4**, select a preferred type of material for the thermometer and explain why? (8 marks)
- (c) Name the type of application or equipment in air conditioning and refrigeration suitable to use the selected thermometer / sensor in question (b) with the temperature ranging from  $-184$  to  $1260$  °C. (2 marks)
- (d) Explain the principle of measurement of the sensor in question (b). (4 marks)

**SECTION B (40 MARKS)**

**Answer only TWO (2) questions.**

**Please use the answer booklet provided.**

**Question 5**

The capacity of a compressor must be controlled because refrigerant loads are seldom constant. Match the following answers on the right with each respective statement on the left and rewrite them on your answer script.

- |                          |  |
|--------------------------|--|
| (a) Compressor cycling   | 1) Once cylinder have a suction pressure above and below, the valve plate so the cylinder does not work. (4 marks) |
| (b) Cylinder unloaders   | 2) Its electrical contacts open or closed and the compressor stops or energizes. (4 marks)                         |
| (c) Cylinder Bypass      | 3) The most efficient method. The compressor turns off only if the evaporator load continues to fall. (4 marks)    |
| (d) Hot gas bypass       | 4) No refrigerant supply from compressor but requires very little power from the motor. (4 marks)                  |
| (e) Variable speed motor | 5) The compressor sees the equivalent of full load all the time. (4 marks)   |

**Question 6**

HVAC system is integrated with Building Automation System (BAS). Explain the control systems as in the following list:

(a) Air filter alarm. (differential pressure = 100 pa) (10 marks)

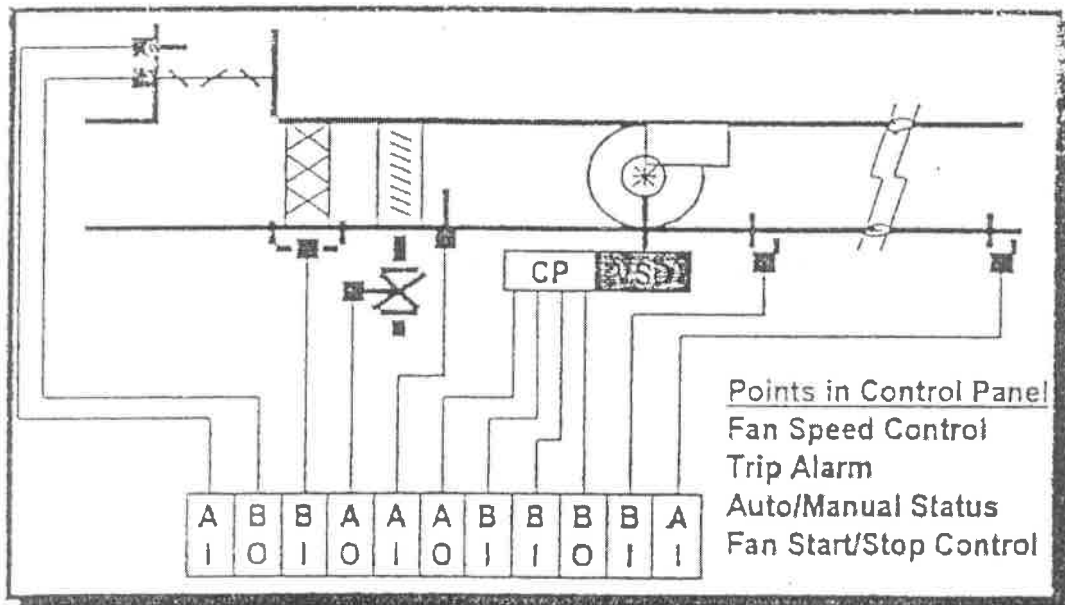
(b) Auto / Manual switch (10 marks)

**Question 7**

**Figure Q7** shows that the HVAC system is integrated with Building Automation System (BAS). Based on the figure below, explain the control systems as in the following:

(a) Variable Speed Drive (VSD) (10 marks)

(b) Control damper in mixing box (10 marks)



**Figure Q7:** Interfacing schematic between Air conditioning components and BMS

**END OF QUESTION**