



UNIVERSITI KUALA LUMPUR
MALAYSIA FRANCE INSTITUTE

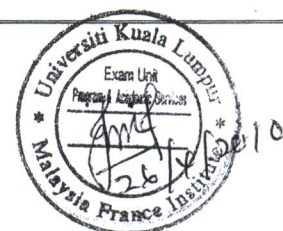
FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE : FCB 30902
SUBJECT TITLE : CONTROL OF REFRIGERATION SYSTEM
LEVEL : BACHELOR
TIME/DURATION : 8.00 pm – 10 pm
2 HOURS
DATE : 27 April 2010

INSTRUCTIONS TO CANDIDATES

1. All documents authorized (Open Book Examination)
2. Please read the instructions given in the question paper CAREFULLY.
3. This question paper is printed on both sides of the paper.
4. Please write your answers on the answer booklet provided.
5. Answer should be written in blue or black ink except for sketching, graphic and illustration.
6. This question paper consists only one section. Answer all questions.
7. Answer all questions in English.

THERE ARE 5 PRINTED PAGES OF QUESTIONS.



INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

- (a). Why is it necessary to have a differential in an ON/OFF controller?
- (b). What is the typical value of differential of a thermostat used in a cold room?
- (c). Explain what happens if the differential is set too high or too low compared to the optimum.
- (d). Complete the following table of comparison of temperature sensors; (reproduce the table in your answer sheet)

Type of sensor	Principle of operation	Main Advantage (one only)	Main disadvantage (one only)
Thermo-couple			
RTD-(PTC)			
Thermistor (NTC)			

(4 marks)

Question 2

The figure below shows schematic of a capacity control of compressor.

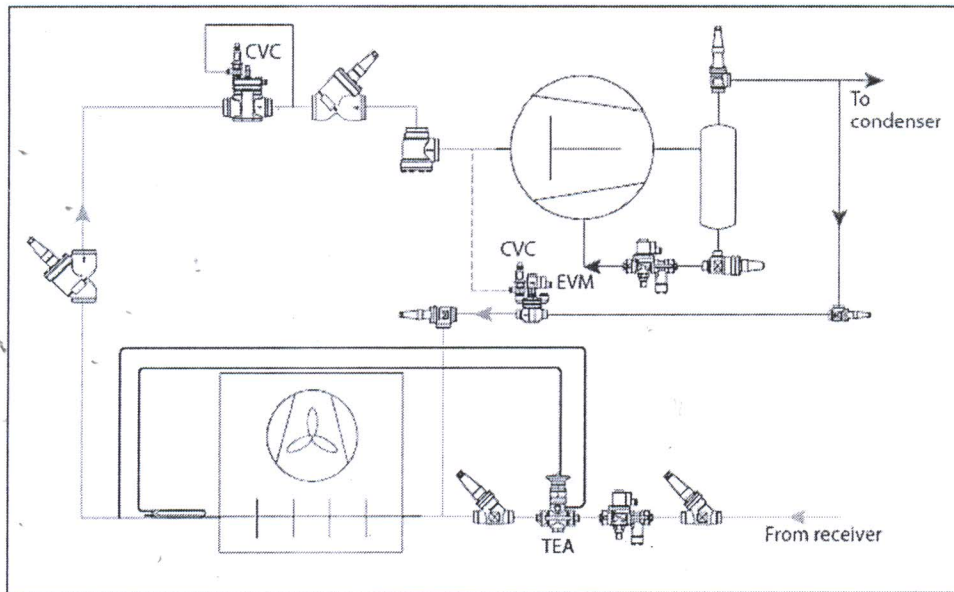


Figure Q2 Schematic of a Compressor control

- What type of capacity control is shown in Figure Q2? Explain its operation. List couple of advantages and disadvantages of this type of capacity controller as compared to other types .
- What type of signal is used as the input for the control?
- Which component is critical for making sure the safety of compressor when the system is operation part-load? Explain in one or two sentences.

(2 marks)

Question 3

- Describe briefly the operation of the valve shown in the cooling water circuit of Figure Q3, explaining the type of signal, application areas and other variations of available design for this type of valve?

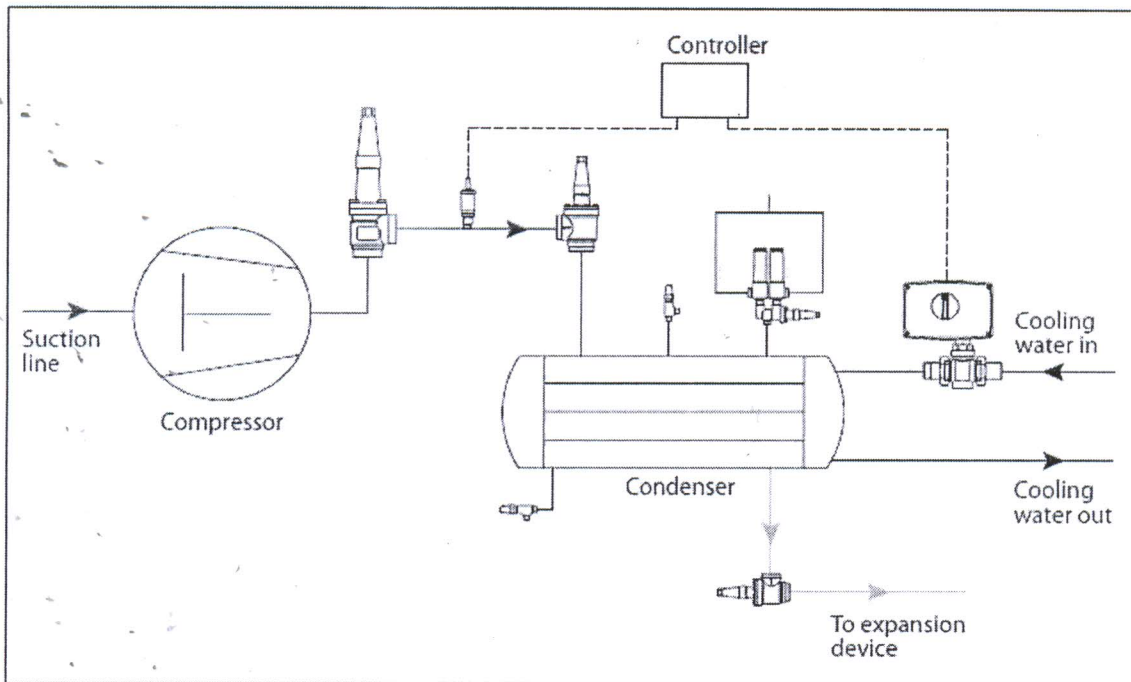


Figure Q3 Schematic of a cooling water control

(b). Given below is some technical specification for such valves

Table Q3 Valve details

	Motor valve - VM 2
Material	Body: red bronze
Media	Circulation water/ glycolic water up to 30%
Media temp. range [°C]	2 to 150
Max. working pressure [bar]	25
DN [mm]	15 to 50

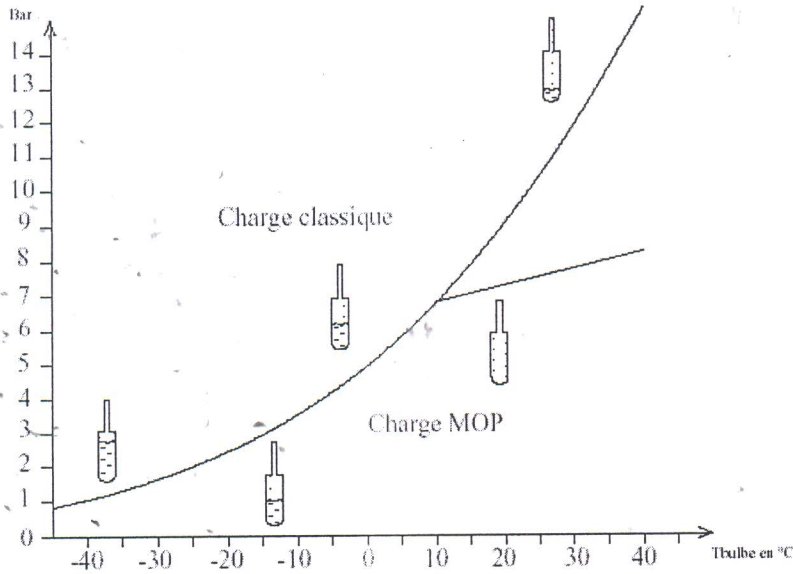
	Motor valve - VFG 2
Material	Body: cast iron/ductile iron/cast steel
Media	Circulation water/ glycolic water up to 30%
Media temp. range [°C]	2 to 200
Max. working pressure [bar]	16/25/40
DN [mm]	15 to 250

If you need to select one such valve for the water cooled test benches in UniKL workshop, which one will you choose?

(3 marks)

Question 4

- (a) Determine the refrigerant charge in a TXV bulb, which is required to be acting MOP over a pressure of 5 bar, charge being R 22. The volume is estimated to be 11.2 cm³ which include the connecting tube and space above diaphragm in the TXV. You are reminded the nature of the MOP TXV is of type as follows. (For the properties please refer to the annex)



- (b) Explain in a couple of sentences what causes hunting of a TXV. How can it be prevented?
- (c) Explain the functioning of electronic expansion valve with the help of a sketch. List couple of advantages and disadvantages of EEV over TXVs

(3 marks)

Question 5

- (a) Why is that evaporator pressure regulator is an upstream pressure regulator. Under what conditions, the use of an EPR is mandatory? Explain with the help of sketch the functioning of evaporator pressure regulator.

- (b). Give an example of a down stream regulator. Under what conditions is it necessary to use?

(2 marks)

Question 6

- (a). Compare the three defrosting methods for their simplicity, cost, effectiveness and energy saving features by filling up the following tables with suitable words

	Off-cycle defrost	Electrical defrost	Hot gas bypass defrost
simplicity			
cost			
effectiveness			
energy saving			

- (b). Explain hot gas bypass defrosting with the help of a sketch
- (c). Why is it that, at times, for electrical defrost method, the heating power of the heater is not counted towards the cooling load of the refrigeration plant?

(3 marks)

Question 7

- (a). Name a few types of communication hardware available in present day DDC technology. Describe briefly the importance of having standard protocol for communication hardware
- (b). With the help of a sketch, explain the internal architecture of a DDC controller

(3 marks)

END OF QUESTION

