**YABA COLLEGE OF TECHNOLOGY**

**SCHOOL OF ENGINEERING**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**SECOND SEMESTER 2016/2017 SESSION**

**CLASS: ND 3 P/T) (MECHANICAL ENGINEERING) PAPER NUMBER: MEC 225**

**COURSE TITLE: REFRIGERATION AND AIR-CONDITIONING TIME ALL: 3HOURS**

**INSTRUCTION:** Attempt question 1 and any other 4 questions, this paper comprises seven (7) questions. All carries equal marks.

**NOTE:** THERE MUST BE NO JOTTING, WRITINGS OR INSCRIPTIONS ON THE QUESTION

PAPER EXCEPT YOUR REGISTRATION NUMBER

**Q1. (a)A** Vapor compressionrefrigeration using R134a works between temperatures limits -6oC and 40oC. The refrigerant leaves the compressor as dry saturated. Calculate the refrigerating effect and C.O.P. If (i) the refrigerant leaves the condenser saturated (ii) the refrigerant is sub-cooled at 20oC before entering the throttle valve (20mrks)

**(b)** With the aid of a neatly and well labeled sketch describe the cycle of operation of the Vapour Absorption refrigeration cycle. (10mrks)

**(c)** Find out the appropriate numbers of the refrigerants whose chemical formula are shown below: (i) C2H2F (ii) CH2F2 (iii) C2H2F5 (iv) C2H4CL4 (v) (5mrks)

**(d)**State five (5) comparism between thermoelectric refrigeration and vapour compression system (5mrks)

**Q2. (a)** Discuss the various modifications carried out on the carnot refrigeration cycle (reverse carnot cycle) for the realization of the theoretical vapour compression refrigeration cycle. (10mrks)

**(b)** Express mathematically using the steady flow energy equation (SSFE) to analysis the process of refrigerant flow from state (1) to state (4) in a vapour compression refrigeration cycle. (5mrks)

**Q3.(a)** State five advantage and disadvantage of the vapour absorption refrigeration cycle (10mrks)

**(b) (i)** List five essential requirements for the choice of a refrigerant-absorbent pair in a vapour absorption refrigeration cycle (2.5mrks)

**(ii)** List five (5) different refrigerant-absorbent pairs (2.5mrks)

**Q4. (a)** Enumerate the various sources of load (heat gain) imposed on a conditioned space (5mrks)

1. Define the following (i) sensible heat gain and (ii) latent heat gain (iii) psychrometric

(iv) Room load (v) cooling load (10mrks)

**Q5.** Briefly define the following terms

**(a)** Refrigeration (b) coefficient of performance (c) refrigerating effect (d) refrigeration capacity

(e) Refrigerating efficiency (10mrks)

1. State three (3) advantages and (2) disadvantages of thermoelectric refrigeration (5mrks)

**Q6. (a)** **(i)** State two (2) advantages and disadvantages each of wet compression (4mrks)

(ii) State three (3) advantages of dry compression (3mrks)

**(b)**State three ways by which the following affects the performance of vapour compression system

1. Increase in evaporating temperature
2. Decrease in condenser temperature (8mrks)

**Q7. (a)** State any six (6) properties of a working fluid to be used for refrigeration Cycle. (3mrks)

(b) Define what you understand by (i) primary refrigerant (ii) Secondary refrigerant (6mrks)

(c)Differentiate between the following pair of terms

1. Dehumidification and humidification
2. Summer air-conditioning and winter air-conditioning (6mrks)