



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN MECHANICAL ENGINEERING (PLANT-TVET OPTION)

REFRIGERATION, AIRCONDITIONING & VENTILATION

DATE: 7/9/2021

TIME: 8:30 – 11:30 AM

INSTRUCTIONS:

This paper consists of five questions, attempt ALL .

1. (a) Explain briefly the following refrigeration terms;
 - I. Refrigerating effect (4 marks)
 - II. Co-efficient of performance
- (b) Using neat plant diagrams illustrate two types of refrigeration systems, giving function of each component. (10 marks)
- (c) Mention Three common problems in refrigeration systems , their cause and remedy . (6 marks)
2. (a) Briefly describe the procedure of charging and evacuating refrigeration system. (10 marks)
- (b) Discuss briefly five methods of detecting leakages in refrigeration systems. (10 marks)
3. (a) i. Describe Four types of primary refrigerants. (8 marks)
ii. Differentiate between primary and secondary refrigerants. (4 marks)
- (b) Explain the following terms used in reference to refrigerants;
 - i. Recover (8 marks)
 - ii. Reclaim
 - iii. Recycle
 - iv. Retrofit
4. (a) Briefly explain the necessity of air conditioning. (6 marks)

- (b) i). Describe the following psychrometric terms; (5 marks)
- I. Humidity ratio
 - II. Sensible heat
 - III. Wet bulb temperature
 - IV. Percentage saturation
 - V. Wet bulb depression
- (c) Using neat sketches explain the following psychrometric processes; (9 marks)
- i. Sensible heating and cooling
 - ii. Humidification
 - iii. Dehumidification
- 5 . (a) Prove that C.O.P for reverse Carnot cycle is given by relation $C.O.P_{hp} - C.O.P_r = 1$,
Where $C.O.P_{hp}$ = heat pump (6 marks)
 $C.O.P_r$ = Refrigerator
- (b) Calculate the refrigerating effect and $C.O.P_r$ for a vapour compression cycle using ammonia. The condensing and the evaporating temperatures are 30°C and -10°C respectively. The liquid leaves the compressor a dry saturated vapour and leaves the condenser as saturated liquid. (8 marks)
- (c) What are the effects of the following in a vapour compression refrigeration system; (6 marks)
- Sub- cooling
 - Superheating
 - Using flash chamber