TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

EEP2307: HEATING,REFRIGERATION &AIR CONDITIONING

SPECIAL SUPPLEMENTARY EXAMINATION

SERIES:AUGUST2017

TIME:2HOURS

DATE:7Sep2017

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a) (i) Define heat **(1Mk)**

(ii) Distinguish between the following terms as applied to heating

(I) Temperature and

(II) Enthalpy (Quantity of heat) **(2Mks)**

(b) (i) List any **FOUR** types of electric heaters **(4Mks)**

(ii) With an aid of a diagram explain the convector heaters **(4Mks)**

(c) Explain the **FOUR** changes in the condition of the fluid that occur as it flows through the refrigeration system. **(8Mks)**

(d) List the **FOUR** types of controlled devices. **(4Mks)**

(e) (i) Define Psychrometrics **(1Mk)**

(ii) The partial pressure of the water vapor in the air is 0.20 psia on a day when the barometric (atmospheric) pressure is 14.69 psi. Find the humidity ratio. **(4Mks)**

(iii) Explain the following Fittings and joining methods for copper tubing.

(I) Soldering

(II) Flaring **(2Mks)**

Question TWO

(a) (i) State the first Law of thermodynamics **(1Mk)**

(ii) A convector in Mr. Jones office is supplying 4000BTU/hr of heat. Heat is being transferred from the room to the outdoors at the rate of 6500BTU/hr.

(I) State the condition of the room energy

(II) Determine the size of the electric heater to be used temporarily to solve the emergency.
(given that 3410BTU/hr = 1000W) **(4Mks)**

(b) List the Five main parts of a furnace **(5Mks)**

(c) (i) Name the Two types of boiler controls **(2Mks)**

(ii) Outline the One programming sequence for a gas-fired boiler (**6Mks)**

(iii) State the Two methods of conserving energy with boilers and furnaces (**2Mks)**

Question THREE

(a) (i) State the **THREE** ways of which heat is transferred. **(3Mks)**

(ii) Calculate the heat energy in joules required to raise the temperature of 4.5 litres of water from 15^0c to 100^oc (The mass of 1 litre of water is 1kg) **(3Mks)**

(iii) Explain the conversion of electricity to heat **(2Mks)**

(b) (i) Explain the following systems of electric heating of water

(I) Instantaneous heaters

(II) Central storage **(4Mks)**

(ii) With air of diagram, state the connections of a three terminal cooker element from the off position, low, medium and high position. **(8Mks)**

Question FOUR

(a) (i) State **TWO** classification of fans **(2Mks)**

(ii) State **TWO** characteristics of good room air distribution **(2Mks)**

(b) (i) Describe the Principal of operation of a centrifugal pump using diagram **(6Mks)**

(ii) Explain the heat pump as a refrigeration system **(4Mks)**

(iii) State the **FOUR** important properties of Refrigerants. **(4Mks)**

(iv) Outline any **TWO** methods considered for conserving energy with Refrigeration systems. **(2Mks)**

Question FIVE

(a) (i) Explain any **THREE** purposes of controls in HVAC systems. **(6Mks)**

(ii) Explain the following elements in control systems of refrigeration

(I) A controlled variable

(II) A controller

(III) A source of energy **(6Mks)**

(b) (i) State **FOUR** controlled devises in HVAC Systems. **(4Mks)**

(ii) With aid of a flow characteristics curve of control valves diagram explain the difference in performance of the control valves. **(4Mks)**