MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

EED 216 POWER ELECTRONICS

DATE: 9/11/2020 **TIME:2.00-4.00 PM**

INSTRUCTIONS

Answer Question One and any Other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Explain the following devices

i. Power diode

ii. Silicon controlled rectifier (SCR)

iii. Thyristor

iv. Converter

v. Inverter (10 marks)

a) With the aid of characteristics curve(s) explain the operation of (SCR) (5 marks)

b) Describe an oscillator circuit (5 marks)

c) Explain briefly a unipolar junction transistor (UJT) (5 marks)

d) A given silicon UJT has an interbase resistance of 10kΩ. It ha Rb_1= 6kΩ and RB_2= 10kΩ, when TE= 0. Calculate

(i) UJT Current if V_{BB}= 20 V, (Hint V_E is less than Vp)

(ii) Peak point voltage Vp (5 marks)

QUESTION TWO (20MARKS)

a) With the aid of labeled diagrams, explain a UJT relaxation Oscillator (5 marks)

b) State any FIVE applications of UJT (10 marks)

c) The wind shield wiper motor of an automobile is controlled by a UJT with Z= 0.6. The capacitor has a value of 50 μF and the charging resistor is a series combination of 50KΩ.

Determine the minimum and maximum of blade strokes per minute possible with this arrangement. (5 marks)

QUESTION THREE (20 MARKS)

a) With the aid of labeled diagram, explain a Heating element. (10 marks)

b) Describe induction heating in the industrial plants (10 marks)

QUESTION FOUR (20 MARKS)

a) Molten materials are placed at the annular Hearth using core type furnaces, explain how the process is done (10 marks)

b) List any TWO applications of induction Heating (2 marks)

c) Briefly explain Eddy currents as applied in high frequency Heating process (8 marks)

QUESTION FIVE (20 MARKS)

a) Give an expression for the depth of penetration when using induction heating (3 marks)

b) List any FIVE advantages of induction heating (5 marks)

c) Describe a cyclo converter circuit (12 marks)