TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

EHL 2301: MEDICAL ELECTRONICS III

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE:16May2016

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) With the aid of diagrams describe how a unijunction transistor (UJT) can be used in a relaxation oscillator. Show the output wave forms generated. **(8marks)**

(b)

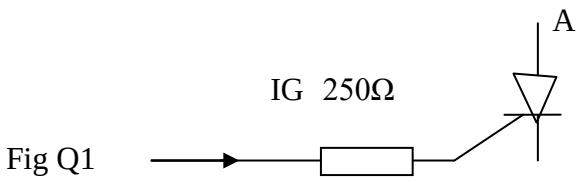

Fig Q1

A 250Ω resistor is connected in series with the gate of a thyristor as shown in fig.Q1 . The gate current required to fire the SCR is 8 Ma. Calculate the value of the input voltage Vin for causing the SCR to breakdown . **(4 marks)**

(c) State the nature of failures common with the following components.

(i) resistors

(ii) variable resistors

(iii) capacitors

(iv) semi conductors devices**.** **(8marks).**

(d) (i) Using labelled diagrams explain the operation of a diac. **(4marks)**

(ii) explain the construction of an SCR. **(6 marks)**

QUESTION TWO

(a).Derive an expression to show that the average voltage through a reverse blocking thyristor is approximately $\frac{VMAX}{\pi}$. **(6 marks)**

(b) A thyristor is used to control the voltage to a resistive load. If $240V_{RMS}$ is used to supply the circuit and the SCR fires 2.0msec after the commencement of every cycle,determine the average current to the load if it has a resistance of 500Ω. **(14 marks)**

QUESTION THREE

(a) Describe the construction and operation of a triac . **(10 marks)**

(b) With the aid of a labelled diagram describe a circuit to control the brightness of an incandescent lamp using a triac.

(10 marks)

QUESTION FOUR

(a) Discuss the following methods of fault diagnosis

(i) half split

(ii) end to end **(6 marks)**

(b) Briefly describe the following devices:-

(i) tunnel diode

(ii) UJT **(10 marks)**

(c) Outline any four applications of thyristors. **(4 marks)**

QUESTION FIVE

(a) Discuss the following as causes of failure in components.

(i) operating stress

(ii) Enviromental stress **(9 marks)**

(b) Explain the following terms as used in maintenance.

(i) Redundancy

(ii) availability

(iii) corrective maintenance **(6 marks)**

(c) Discuss any two advantages of using a thyristor as a switch over mechanical switches**.**

(5marks).