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

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2HOURS

DATE: Pick DateSep 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE

a) Using the two transistor analogy and characteristic curves, describe the construction and operation of a SCR.

(10 marks)

b) With the aid of a diagram and output waveforms, explain the operation of an UJT relaxation oscillator.

(10 marks)

QUESTION TWO

a) With the aid of voltage/current characteristic curve, describe the operation of a SCR.

(8 marks)

b) Draw a circuit diagram of a varactor diode frequency modulator and describe its operation.

(8 marks)

c) Describe the function of the following tests in logic fault-finding

i) Dynamic

ii) Static

(4 marks)

QUESTION THREE

a) State THREE advantages of using gate pulse technique for triggering thyristors

(3 marks)

b) Show, with the aid of a circuit diagram and waveforms, how a triac may be used to control the brightness of theatre lights connected to the mains.

(10 marks)

c) With the aid of a graph, explain the variation of percentage failure rate with the age of equipment.

(7 marks)

QUESTION FOUR

a) Derive an equation relating thyristor current, leakage currents and two transistor's gains in an analogy circuit.

(8 marks)

b)

i) Define the term failure as used in reliability studies.

ii) Explain FOUR ways by which failures in medical electronic equipment may be categorized.

(9 marks)

c) Draw a labeled equivalent circuit diagram of a varactor diode.

(3 marks)

QUESTION FIVE

a) The circuit of figure 2 shows a common emitter amplifier.

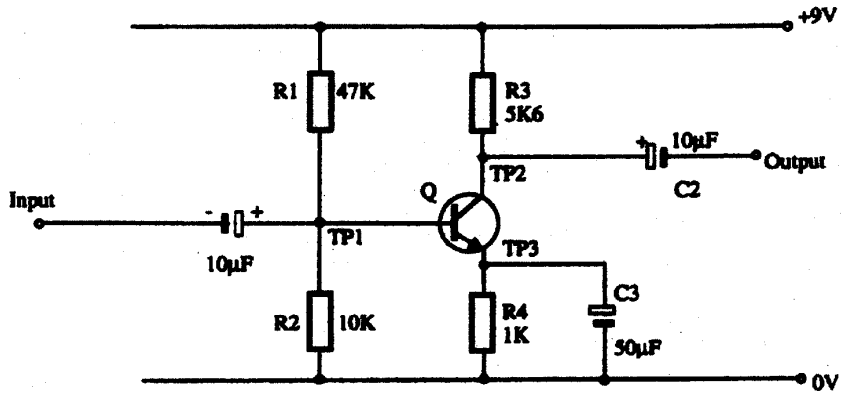

Figure 2

i) Calculate the normal voltages at the given test points.

ii) Table 1 shows the voltage readings at the test points (TP) for various component faults In each case, state which component is faulty and the type of fault.

(10 marks)

	TP1	TP2	TP3	Additional symptoms
FAULT A	1.6	9	1.0	No output signal
FAULT B	1.6	1.4	1.4	No output signal
FAULT C	1.6	4.0	0.8	Output signal with very low gain

Table 1

b)

i) With the aid of a sketch, explain the principle of operation of a varactor diode.

ii) Draw V-I curve for a varactor diode and explain its shape.

(10 marks)