THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

FORM TWO NATIONAL ASSESSMENT

080 ELECTRONICS AND COMMUNICATION ENGINEERING

Time: 2:30 Hours. **Year: 2024**

Instructions

1. This paper consists of sections **A**, **B** and **C** with a total of **ten (10)** questions.
2. Answer **all** questions.
3. Section A carries **15** marks; section B carries **70** marks and section C carries **15** marks.
4. All writing must be in **black** or **blue** ink and drawings must be in **pencil**.
5. Cellular phones and unauthorized materials are **not allowed** in the examination room.
6. Write your **Assessment Number** at the top-right hand corner of every page.

FOR EXAMINER'S USE ONLY		
QUESTION NUMBER	**SCORE**	**EXAMINER'S INITIIALS**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL		
CHECKER'S INITIALS		

SECTION A (15 Marks)

Answer **all** questions in this section

1. Choose the correct answer from alternatives (A to D) by writing its letter in the box provided:

(i) The emitter base of an NPN BJT transistor is normally forward biased and its collector base is reverse biased. How does collector current behave when the base current is increased?

A It decreases B It increases

C It doubles D It remains constant

(ii) Identify the parameter, which its value remains the same in a series circuit

A Voltage B Power

C Resistance D Current

(iii) Which instrument represent a thin flat piece of plastic containing various cut-out shapes like circles, bolts, and ellipse?

A Protector B Template

C Perforator D Divider

(iv) Some of the electronics devices perform both communication and metrological functions. Identify the device which saves both purposes.

A Television B Computer

C Satellite D Oscilloscope

(v) How does the conductivity of the intrinsic semiconductor behave when temperature rises?

A Remains constant B Increases

C Decreases D Becomes zero

(vi) You are given a task to draw a block diagram of a communication system showing the flow of signals. In which sequence will a signal flow?

A From right to left

B From left to right

C From top to bottom

D From bottom to top

(vii) Before starting measuring voltage using cathode ray oscilloscope (CRO), beam spot should be located at the correct position on the screen. Which one refers to the correct position?

A Center of the screen

B Top right of the screen

C Top center of the screen

D Top left of the screen

(viii) Identify the first action to be taken when someone is suffering from electric shock.

A Call for an ambulance

B Disconnect from the supply

C Run for helping the victim on their back

D Lay the victim on their back

(ix) What will happen when a transformer is supplied with dc source above 30 V

A Transformer will step down the voltage

B Transformer will operate with high efficiency

C Transformer will be damaged

D Transformer will operate with low efficiency

(x) A technician checked a radio receiver and discovered that the rectifier circuit was completely defective. Which combination of components will the technician use to make a new rectifier circuit?

A Transformer, diodes and resistor

B Diodes, transformer and capacitor

C Inductor, capacitor and resistor

D Resistor, transformer and capacitor

2. Match the functions of measuring instruments in List A with their corresponding instruments in List B by writing a letter of the correct response.

List A	**List B**
(i) An electric current	A. Ohm
(ii) An electric energy	B. Joule
(iii) P.D between two points in an electric circuit	C. Watt
(iv) An electric charge	D. Volt
(v) Electric resistance in one volt per ampere	E. Ampere
	F. Ampere
	G. Farad
	H. Hertz

Answers

(i)	(ii)	(iii)	(iv)	(v)

SECTION B (70 Marks)

Answer **all** questions from this section.

3. (a) Transistor operation is based on charge levels made of P-type and N-type semiconductor materials. Draw unbiased P-N junction indicating the following:
   (i) Depletion layer.
   (ii) Majority charge carriers in each region.

(iii) The direction of junction voltage.

(b) Using diagrams, illustrate three different ways of configuring NPN transistor in amplifier circuit.

(i) .....
.....
.....

(ii)

.....

.....

.....

(iii)

.....

.....

.....

4. (a) Why are the following measuring instruments needed when troubleshooting a faulty radio receiver?
   (i) Multimeter

   (ii) oscilloscope

   (b) The CRO display of a pulse waveform indicates that the time/cm switch is on 50 ms/cm and the volts/cm switch is on 0.2 V/cm. Determine:

   (i) Periodic time

   (ii) Frequency

   (iii) Magnitude of the pulse voltage

5. (a) Figure 1 below is a schematic diagram of an electronic system that converts a.c to d.c signal. Represent the figure with a block diagram showing the sequence of the signal flow.

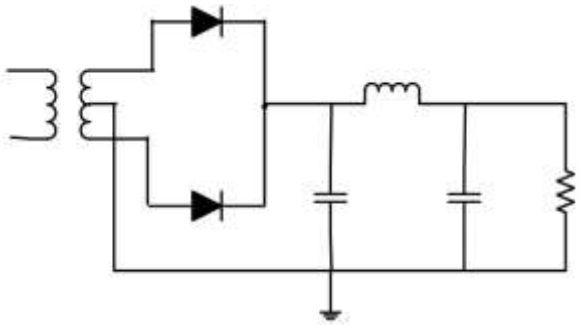


Figure 1

(b) An a.c source is applied to a circuit which consists of one PN junction diode, a transformer and a load resistor to produce a d.c signal output. Use the given components to construct a circuit diagram and show the produced output waveform.

6. (a) Resistor is a basic and important component in electronics circuits.

(i) Classify resistors according to their voltage-current (V-I) characteristics.

.....

.....

.....

.....

(ii) Determine the maximum and minimum resistance range of a resistor with yellow, violet, orange and gold colour codes.

.....

.....

.....

.....

(iii) Suggest an instrument which can be used to measure the resistance of a resistor.

.....

.....

.....

.....

(b) A resistor in part (a) (ii) is needed to be tested. You are given a supply voltage, a voltmeter, an ammeter and a bulb. Draw the circuit to show the connection of the ammeter and voltmeter to measure the circuit current and potential difference across the resistor under test when connected in series with the bulb.

7. (a) In a performance test of a transistor amplifier, a change of 200 mV in base-emitter voltage caused a change of 100 μA in the base current. Calculate its input resistance.

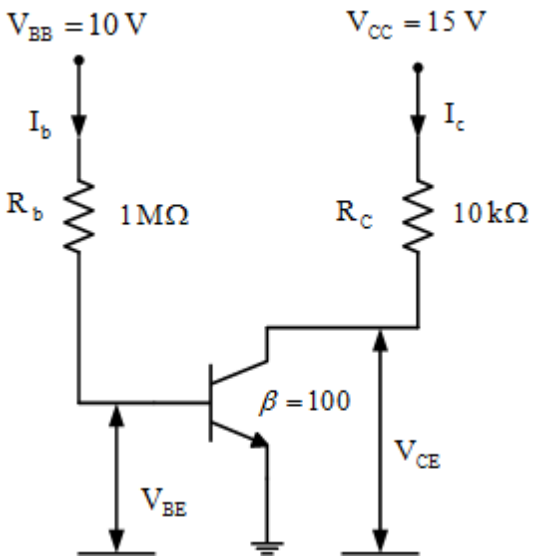
.....

.....

.....

.....

(b) The NPN transistor circuit in figure below is required to replace the faulty one in a certain electronic system.



To ensure better performance of the circuit in above before replacement, calculate the following parameters (Neglect V_{BE}):

(i) I_B.....

.

.....

.....

.....

.....

(ii) I_C

.....

.....

(iii) I_E

.....

.....

.....

.....

.....

(iv) V_{CE}

.....

.....

.....

.....

.....

8. (a) Although a pure germanium has more free electrons and higher conductivity than silicon, it was observed that silicon is more widely used in semiconductor devices than germanium. Give a reason for this observation.

.....
.....
.....
.....
.....

b) Use well labelled diagrams to differentiate the energy levels of the following materials:

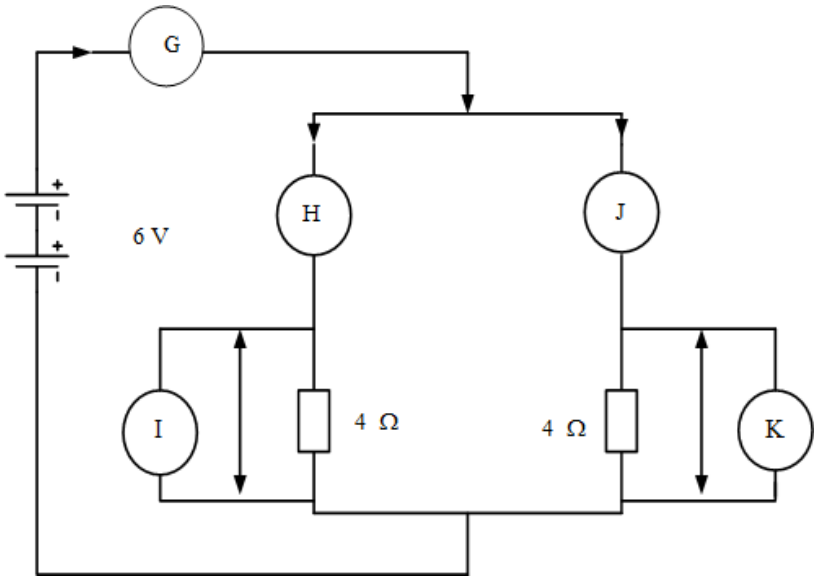
(i) Insulator

(ii) Semiconductor

(iii) Conductor

9. You have been given 2 circles with 90 mm diameter and 45 mm diameter. Using concentric circle method, draw an ellipse by using a compass, a ruler and a protractor only.

10. The figure below represents a measuring instrument used in the electronics workshop. Study it and answer the questions that follow.



(i) Identify the names of the instruments labelled by letters G, H, J, I and K with its function according to the positions to which they are connected. Calculate the total resistance of the circuit.

(ii) Calculate the value measured by the instruments labelled by letter G, H and J.

(iii) Find the value measured by the instruments labelled by letter I and K.

(b) Do you agree that, data in analogue measuring instruments are more likely to be read wrongly than digital instruments? Give two reasons to support your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....