



# **MAASAI MARA UNIVERSITY**

## **REGULAR UNIVERSITY EXAMINATIONS 2018/2019 ACADEMIC YEAR SECOND YEAR SECOND SEMESTER**

### **SCHOOL OF SCIENCES BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

**COURSE CODE: PHY 3209**

**COURSE TITLE: ELECTRONICS 1**

**DATE: 17<sup>TH</sup> APRIL 2019**

**TIME: 0830 - 1030HRS**

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#### **INSTRUCTIONS TO CANDIDATES**

1. Answer Question **ONE** and any other **TWO** questions
2. Question one carries 30 marks while each of the others carries 20 marks.
3. Credit will be awarded for clear explanations and illustrations.

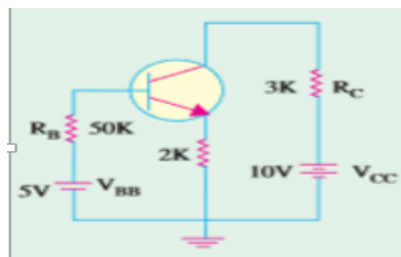
*This paper consists of 4 printed pages. Please turn over.*

### QUESTION ONE

- In terms energy bands distinguish, between insulators, conductors and semiconductors. (3marks)
- Find the intrinsic carrier concentration in silicon at  $300^0$  K for  $N = 3 \times 10^{25}m^{-3}$ ,  $E_g = 1.1eV$  (4marks)
- Explain how P-type extrinsic semi-conductor is formed (3marks)
- State two uses of bipolar junction transistor in electronics (2marks)
- Derive an expression for forward current gain and leakage current of common-emitter configuration in terms of current gain and leakage current of common –base configuration. If  $a=0.98$ ,  $I_{CBO} = 5mA$ , calculate b and  $I_{CEO}$  (5marks)
- Define ‘FET’ and state two types of FETs (4marks)
- Give two situations in which direct coupling of amplifiers is permissible (2marks)
- A transistor operating in CB configuration has  $I_C = 2.98mA$ ,  $I_E = 3.00mA$  and  $I_{CO} = 0.01mA$ . what current will flow in the collector circuit of this transistor when connected to CE configuration with a base current of  $30\mu A$ . (4marks)
- State three uses of light emitting diodes (3marks)

### QUESTION TWO

- With the aid of diagram explain forward biasing of P-N junction (5marks)
- Name three parts of transistor and state their functions (3marks)
- In a simple amplifier circuit ,shown in the figure below, with base resistance,  $R_B = 50K$ ,  $R_E = 2K$ ,  $R_C = 3K$ ,  $V_{CC} = 10V$ ,  $h_{FE} = 100$ , determine whether or not the silicon transistor is in the saturation and find  $I_B$ ,  $I_C$ . Explain the saturation region in common – emitter characteristics (6marks)



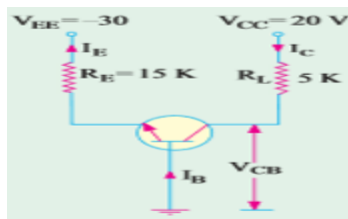
- State four advantages of FETs (4marks)
- What are breakdown devices (2marks)

### QUESTION THREE

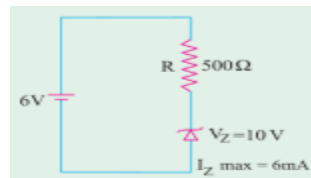
- State four main applications of semiconductor diodes in modern electronic circuitry (4marks)
- The reverse saturation current of an NPN transistor in common-base circuit is  $12.5\mu\text{A}$  for an emitter current of  $2\text{mA}$ , collector current is  $1.97\text{mA}$ . Determine the current gain and base current. (5marks)
- State four uses of zener diodes (4marks)
- Sketch the volt-ampere characteristics of the d.c behavior of the P-N diode both in forward and reverse bias. (5marks)
- Explain why at the junction of zener diode has low resistance in the break down region. (2marks)

### QUESTION FOUR

- The current transfer characteristics for a common base circuit is rarely use for audio-frequency circuits. Give two reasons. (2marks)
- Explain the terms (i) active region and (ii) quiescent point as use in d.c load line of a transistor. (2marks)
  - For the circuit shown in the figure below. Draw the dc load line and locate its quiescent or the dc working point. (6marks)



- Determine whether the ideal zener diode in the figure below is properly biased. Explain why? (4marks)



- Name four circuit applications of UJT (4marks)

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