**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** **info@must.ac.ke**

**University Examinations 2016/2017**

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND FORENSICS ,BACHELOR OF SCIENCE IN COMPUTER SCIENCE , BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGYAND BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY

**SPS 3200: BASIC ELECTRONICS**

**DATE: December, 2016 TIME: HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE - (30 MARKS)**

1. (i) Define the term PN junction. (1 Mark)
2. Draw a labeled diagram of a PN junction (1 Mark)
3. Give three applications of a PN junction (3 Marks)

b) The figure below shows an NPN transistor for which$ I\_{Ε}=10mA$, D.C current gain

$ ∝=0.967.$ Find the values of $I\_{C}$ and $I\_{B}$. ( 2 Marks)

c) Define the following terms;

1. Breakdown voltage (2 Marks)
2. Peak inverse voltage (PIV) (2 Marks)
3. Maximum power rating (2 Marks)

d) Define the term breakdown of an isulator. (2 Marks)

e) Using relevant diagrams distinguish between insulators, conductors and semiconductors. (3 Marks)

f) Explain the energy band theory. (1 Mark)

g) In a common base configuration, the value of collector current is 5.10mA and the value of emitter current is 5.18mA. Calculate the common base d.c current gain. (2 Marks)

h) Give an example of;

1. Elemental semiconductor (1 Mark)
2. Compound semiconductor (1 Mark)
3. (i) Name two types of currents in semiconductors. (2 Marks)

(ii) Define doping. (2 Marks)

j) Define the following parameters as used in BJT transistors.

1. $β\_{DC}$ (1 Mark)
2. $∝\_{DC}$ (2 Marks)

**QUESTION TWO (20 MARKS)**

1. (i) Define the term Fermi level. (1 Mark)

(ii) Distinguish between Fermi level in N-type semiconductor and Fermi level in P-type semiconductor with regards to change in temperature. (4 Marks)

(iii) Define the term intrinsic concentration. (2 Marks)

1. (i) Determine the forward current for a germanium diode at room temperature when the voltage across it is 0.3V. Assume room temperature is $27^{∘}$C and reverse saturation current is 1Na volt equivalent of temperature is $r= \frac{T}{11,600}$ (4 Marks)

(ii) Distinguish between common emmiter configuration and common collector configuration. (4 Marks)

1. (i) Draw a circuit diagram of an NPN transistor (2 Marks)

(ii) Define the term A.C current gain of a BJT transistor in common base configuration. (3 Marks)

**QUESTION THREE (20 MARKS)**

1. Define the term OP-Amp. (2 Marks)
2. Design a circuit showing how an OP-Amp can be used as;
3. Summer with three inputs (3 Marks)
4. Non-inverting amplifier (3 Marks)
5. Calculate the output voltages of an OP-Amp summer (Adder) for the following set of input voltages and Resistors. (4 Marks)

$V\_{1}=1 volt$ $V\_{2}=2 volt V\_{3}=3 volt$

$R\_{1}=500 kΩ $ $R\_{2}=1MΩ$ $R\_{3}=1MΩ$ &$R\_{F}=1MΩ$

1. (i) State three types of transistors. (3 Marks)

 (ii) Differentiate between transfer and drain characteristics of a JFET. (4 Marks)

1. Name the material used in the construction of a tunnel diode. (1 Mark)

**QUESTION FOUR (20 MARKS)**

1. (i) State the effect of the depletion region on a PN junction during reverse bias and forward bias. (2 Marks)

 (ii) Give three applications of the diode whose symbol is shown below;

1. With the aid of a diagram explain the working of a full-wave bridge rectifier.(4 Marks)
2. A diode operating at $300^{∘}k$ has V(forward) of 0.4V across it when the current through it is 10mA and 0.42V when the current is twice as large. What values of $I\_{0}$ and $η$ allow the diode to be modeled by the diode equation

 (6 Marks)

1. Complete the diagram below of an NPN transistor by providing the associated currents and their directions. (2 Marks)
2. Differentiate between zener breakdown and avalanche breakdown. (3 Marks)