TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN SCIENCE LABORATORY TECHNOLOGY (DSLT 12J)

APS 2301: PHYSICS TECHNIQUES III - ELECTRONICS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Explain the following terms:
- **(i)** Doping
- **(ii)** Intrinsic semiconductor
- **(iii)** Extrinsic semiconductor
- **(iv)** P type and N-type semiconductors **(8 marks)**

b) (i) State any THREE advantages of the zenor diode as a voltage regulator. **(3 marks)**

(ii) Explain what is meant by "Break over voltage' used in silicon controlled rectifiers. **(2 marks)**

c) In the circuit below calculate:

- **(i)** Calculate the voltage across the 100kΩ resistor. **(2 marks)**
- **(ii)** Calculate Ic if hfe = 60 **(3 marks)**
- **(iii)** Calculate the voltage across the 1kΩ resistor. **(2 marks)**
- **(iv)** Calculate V_{CE} **(2 marks)**

Figure 1

d) With an aid of a diagram, show how a multimeter can be used to measure and voltage an electric circuit. **(5 marks)**

e) State any THREE disadvantages of hot wire instruments. **(3 marks)**

Question Two

a) Using symbols differentiate the PNP and NPN transistors. **(2 marks)**

b) Explain the following concepts:
- **(i)** Rectification
- **(ii)** Voltage regulation **(4 marks)**

c) With the aid of a circuit diagram, explain the operation of the full wave bridge rectifier. **(9 marks)**

Question Three

a) Explain the following terms:
- **(i)** Truth table
- **(ii)** NOT gate
- **(iii)** OR gate **(6 marks)**

b) Given the Boolean expressions below. Draw their general logic gate arrangement:

(i) $Y = (A + B)\ (\overline{A} \bullet \overline{B})\ \overline{(A \bullet \overline{B}C)}$ **(3 marks)**

(ii) $Y = \overline{(A + B)}\ (A \bullet \overline{B})\ \overline{(A \bullet B)}$ **(3 marks)**

c) Convert 120_{10} to binary. **(3 marks)**

Question Four

a) Explain any THREE characteristics of operational amplifiers. **(6 marks)**

b) With the aid of a circuit diagram, explain the working principle of the silicon controlled rectifier. **(9 marks)**

Question Five

a) Explain what is meant by field effect transistor. **(2 marks)**

b) State any FOUR advantages of the junction field effect transistor. **(4 marks)**

c) With the aid of a diagram explain the working principle of the junction field effect transistor. **(9 marks)**