



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 Email: info@must.ac.ke

University Examinations 2013/2014

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL
ENGINEERING

EEE 0207: ELECTRONICS I

DATE: APRIL 2014

TIME: 1 ½ HOURS

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

QUESTION ONE – (30 MARKS)

- (a) Using energy band theory explain the basic difference between conductors and insulators. (3 Marks)
- (b) How many valence electrons does a semiconductor have? (1 Mark)
- (c) Why does semiconductors have fewer free electrons than conductors? (2 Marks)
- (d) Define doping. (2 Marks)
- (e) Explain how n-type semiconductors are formed. (4 Marks)
- (f) What is the majority carrier in a p-type semiconductor? (2 Marks)
- (g) What is the difference between intrinsic and extrinsic semiconductors. (4 Marks)
- (h) What is the average value of the half-wave rectified voltage in figure 1.1 below (3 Marks)

- (i) Define the following
- (i) β_{DC} (2 Marks)
 - (ii) α_{DC} (2 Marks)
- (j) When a transistor is used as a switch, in what two states is it operated? (2 Marks)
- (k) Under what condition is $V_{CE} = V_{CC}$ in a transistor? (2 Marks)

QUESTION TWO – (15 MARKS)

- (a) Draw a diagram of a silicon crystal showing the silicon cores, covalent bonds and thermally generated electron hole pairs. (5 Marks)
- (b) With the aid of a diagram explain the IV characteristics curve of a pn junction. (5 Marks)
- (c) Calculate the value of a resistor used in the following circuits given that LED forward voltage drop is 3.0V and requires 20mA to emit sufficient light. (5 Marks)

QUESTION THREE – (15 MARKS)

- (a) Draw the output voltage waveform indicating its peak value of a half-wave rectifier shown below for the given input voltage waveform. (5 Marks)

(b) Find the average value of the full-wave rectified voltage in figure 3.2 below.
(3 Marks)

(c) Determine the peak output voltage for the bridge rectifier shown in figure 3.3 below, given that the transformer is specified to have a 12V rms secondary voltage for 110V rms across the primary.
(4 Marks)

(d) What is the PIV rating required for the Silicon diodes used rectifier shown in figure 3.3.
(3 Marks)

QUESTION FOUR – (15 MARKS)

- (a) Name the two types of BJTs according to their consideration. (2 Marks)
- (b) What are the bias conditions of a base-emitter and base-collector junctions for a transistor to operate as an amplifier. (2 Marks)
- (c) Determine β_{DC} , I_E , and α_{DC} for a transistor where $I_B = 50\mu A$ and $I_C = 3.65mA$.
(6 Marks)

- (d) Determine whether or not the transistor in Figure 4.1 below is in saturation. Assume $V_{CE(sat)} = 0.2V$ (5 Marks)