



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED 113: ANALOGUE ELECTRONICS

DATE: 3/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer question one and any other two questions

QUESTION ONE (30 MARKS)

- a) i Materials are classified into three categories. Name them. (3 marks)
- ii Draw the structure of carbon atom (2 marks)
- iii Draw the symbols for the following diodes
- i) Signal or rectifier diode
- ii) Silicon controlled rectifier (thyristor)
- iii) Triac
- iv) Photodiode
- v) Varactor diode (5 marks)
- b) i State a typical practical application of a zener diode and sketch its circuit diagram symbol. (3 marks)
- ii An amplifier has a current gain of 40 and a voltage gain of 30. Determine the power gain (3 marks)
- iii Given V_{cc} of a circuit is 12V, calculate the value for R_B for a germanium transistor (0.2V) if $I_B = 20\mu A$. (4 marks)
- c) i Name two types of FETS and State a characteristic of each (4 marks)

- ii Explain the following terms used in J FETS
 - i) Source
 - ii) Drain
 - iii) Gate
- (6 marks)

QUESTION TWO (20 MARKS)

- a) i Name and draw the three transistor configurations. (6 marks)
- ii The current gain of a certain transistor is 99. Calculate
 - i) The α D.C of the transistor
 - ii) The collector current when the transistor is connected in CE mode with a d.c base current of $50\mu\text{A}$ (6 marks)
- b) i Draw the p-n-p transistor showing clearly the depletion area. (2 marks)
- ii For a bipolar junction transistor, show that $\beta = \alpha/(1 - \alpha)$ where β = common emitter gain and α = common base gain. (6 marks)

QUESTION THREE (20 MARKS)

- a) i Draw the symbol for a FET n channel (3 marks)
- ii Draw labeled schematic symbols of P channel MOSFET (5 marks)
- b) i State three differences between Bipolar and Unipolar junction transistors (4 marks)
- ii A field effect transistor operates with a drain current of 100mA and a gate source bias of -1V . The device has a gfs value of 0.25. If the bias voltage decreases to -1.1V , determine a) the change in drain current, and b) the new value of drain current. (8 marks)

QUESTION FOUR (20 MARKS)

- a) i Differentiate n-type and p-type materials (4 marks)
- ii Draw the symbol for
 - a) PN diode
 - b) Bipolar transistor. (4 marks)
- b) i Differentiate intrinsic from extrinsic semi conductor material (3 marks)
- ii Using illustrations, explain the following processes in a P-N junction

- i) Depletion layer
 - ii) Barrier potential
 - iii) Diffusion current
- (9 marks)

QUESTION FIVE (20 MARKS)

- a) i Name three advantages of transistors over vacuum tubes. (3 marks)
- ii Draw a labeled voltage current (V-I) characteristics curve of a P-N junction (5 marks)
- iii Explain how a semiconductor material like silicon can be made a good conductor of electricity. (3 marks)
- b) The figure below shows a transistor amplifier circuit. Determine
- i. base current
 - ii. collector current
 - iii. collector to emitter voltage
- (7 marks)

