



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD YEAR FIRST SEMESTER DIPLOMA IN MECHANICAL ENGINEERING

MED-PR-304: ANALOGUE ELECTRONICS

DATE: 1/8/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

This paper consists of FIVE Questions. Answer Question ONE and ANY OTHER TWO questions.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) With the aid of well labeled diagrams, explain the Bohr atomic structures of the following elements.
 - i) Conductors
 - iii. Semiconductors (4 marks)
- b) Explain the effect of temperature on a semiconductor under the following conditions
 - i. Below zero degrees
 - ii. At absolute zero
 - iii. Above absolute zero (6 marks)
- c) With the aid of well labeled diagrams, explain the formation of a P-N junction (6 marks)
- d) If an external voltage is added to the P-N junction in (c) above, explain what could be the effect. (4 marks)
- e) By the aid of a circuit diagram, explain the operation of a single stage amplifier (10 marks)

QUESTION TWO (20 MARKS)

- a) Explain three properties of semiconductors (6 marks)
- b) Differentiate between Intrinsic semiconductors and Extrinsic semiconductors (4 marks)
- c) i) Calculate the operating point of a transistor whose collector load is $8k\Omega$ and the transistors' quiescent current is 2mA. Take VCC as 20V. (6 marks)
- ii) If RC was to be put to $10K\Omega$, what could be the operating point of the transistor in (i) above (4 marks)

QUESTION THREE (20 MARKS)

- a) In a common base connection, the emitter current is 10mA. If the emitter circuit is open, the collector current is 100mA. Find the total collector current given that $\alpha = 0.98$ (6 marks)
- b) With respect to a common emitter connection, derive the relationship between β and α . (6 marks)
- c) Find the values of collector and emitter currents in a transistor having $I_{CBO}=3\mu A$, and $D_C=0.98$ when its base current is $60\mu A$. (8 marks)

QUESTION FOUR (20 MARKS)

- a) By the aid of well labeled diagram, explain the V-I characteristics on the following considerations: -
i) Forward biasing
ii) Reverse biasing (12 marks)
- b) In (a) above, highlight the parts of the V-I characteristics graph drawn (8 marks)

QUESTION FIVE (20 MARKS)

- a) With the aid of a well labeled diagram, explain a single stage emitter amplifier circuit (14 marks)
- b) Explain any six types of diodes and their application in the world of electronics. (6 marks)