



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

EHL 2104 : MEDICAL ELECTRONICS I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 10 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

- a) i. Explain the following terms as used in semiconductor theory
- I. N – Type semiconductor
 - II. Extrinsic semiconductor
 - III. Intrinsic semiconductor
- ii. State any **FOUR** qualities of a resistor wire used in manufacturing wire wound resistors
(10 marks)
- b) i. With the aid of a circuit diagram explain the operation of a half- wave rectifier circuit
(5 marks)
- ii. From the **Q bi.** Above, derive an expression for V_{mean} **(5 marks)**
- c) i. Explain **THREE** possible junction transistor amplifier configurations **(6 marks)**
- ii. State two advantages and disadvantages of fixed biased circuit **(4 marks)**

QUESTION 2.

- a) i. Give any **TWO** practical applications for each of the following
- I. P-N diode
 - II. Zener diode **(4 marks)**
- ii. With the aid of diagrams explain how the following is achieved:
- I. Forward biased P-N junction
 - II. Reverse biased P-N junction **(6 marks)**
- b) i. With the aid of a suitable diagrams explain the operation of a capacitor filter
(6 marks)
- ii. State any **FOUR** electrical characteristics of a capacitor which are normally specified in a data book
(4 marks)

QUESTION 3

- a) i. Explain the term ‘thermal-run away’ as used in transistor amplifiers.
- ii. With the aid of a diagram explain the construction and operation of forward biased NPN transistor.
(10 marks)

- b) i. The **fig.Q3** below uses germanium transistor. Given that h_{FE} is 49 and $I_c = 2\text{mA}$. Calculate:
- I. Base current I_B
 - II. The value of R_B
 - III. The value of I_E
- (6 marks)**

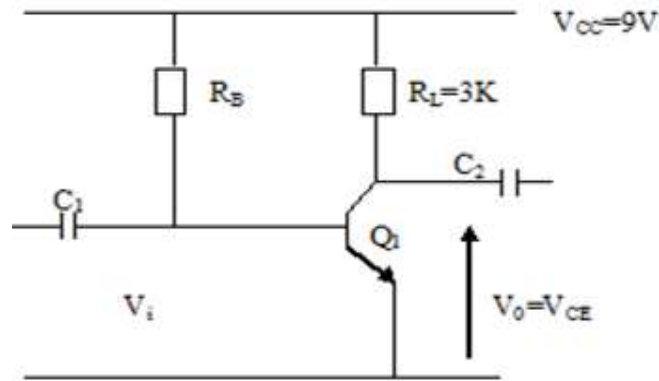


Fig. Q3

- ii. State **FOUR** merits of using emitter feedback circuit **(4 marks)**

QUESTION 4

- a) i. With the aid of a diagram explain the operation of a full wave bridge rectifier circuit
 ii. State **FOUR** advantages of a full wave rectifier over half wave rectifier **(10 marks)**

- b) i. Explain the meaning of the following terms as used in diode characteristics

- I. "Peak inverse voltage"
- II. Avalanche breakdown **(4 marks)**

ii. A zener diode stabilizing circuit is to provide a 24V stabilized supply to a variable load. The input voltage is 30V and a 24V, 400mW zener diode is to be used.

- I. Draw a suitable circuit diagram
- II. Calculate the series resistance R_s
- III. The diode current when the load resistance is 2000Ω **(6 marks)**

QUESTION 5

- a) i. Explain briefly any **TWO** types of electron emission **(4 marks)**

- ii. With the aid of a diagram explain the construction of a triode valve. **(6 marks)**

- b) i) With the aid of simple circuit diagrams explain how a capacitor can be used as a coupling and decoupling device
- ii). State four applications of capacitors **(10 marks)**