



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST YEAR SEMESTER ONE EXAMINATION FOR

CRAFT IN ELECTRICAL ENGINEERING

ANALOGUE ELECTRONICS

DATE: 1/12/2021

TIME: 8.30-11.30 AM

INSTRUCTIONS: ANSWER ALL THE FIVE QUESTIONS

1. (a) Explain each of the following with respect to semiconductors:
 - i. Donor atom
 - ii. Valency
 - iii. Doping
 - iv. Covalent bond. (8 marks)
- b) With the aid of labelled diagrams, distinguish between Intrinsic and Extrinsic semiconductor material. (12 marks)
2. (a) With the aid of a labelled diagram, describe the formation of a PN junction. (6 marks)
- b) Draw a circuit diagram showing diode connected in forward biased mode and explain its operation. (6 marks)
- c) On the same axis, draw and explain the characteristic curve of a PN junction in forward and reverse biased modes. (8 marks)
3. (a) State three applications of semiconductor diodes (3 marks)
- b) Distinguish between half-wave and full-wave rectifier. (4 marks)
- c) (i) With the aid of a circuit diagram, explain the operation of a full-wave bridge rectifier.
- (ii) State two advantages of the rectifier in c (i) over the full-wave rectifier using the centre-tap transformer. (13 marks)

4. (a) (i) With an aid of a characteristic curve, explain the operation of a zener diode.
(ii) State one application of a zener diode. (12 marks)
- (b) Draw a labelled circuit diagram of a voltage doubler and explain the working of the circuit. (8 marks)
5. (a) With an aid to a labelled construction diagram, explain the principle of operation of a Light Emitting Diode. (8 marks)
- (b) An LED with a forward voltage drop of 1.2V is connected across a 9 V supply. Determine the value of series resistor required to limit the current through the LED to 30mA. (4 marks)
- (c) State three advantages of LEDs as a light source over incandescent lamp. (3 marks)
- (d) With an aid of a circuit diagram explain the working of an NPN transistor as an amplifier. (5 marks)