



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL ENGINEERING

ANALOGUE ELECTRONICS

DATE:

TIME:

INSTRUCTIONS TO CANDIDATES:

ATTEMPT ALL QUESTIONS

1. (a) Explain each of the following with respect to semiconductors:
 - i. Valence electron
 - ii. Doping
 - iii. Covalent bond. (6 marks)
- b) With the aid of diagrams, distinguish between Intrinsic and extrinsic semiconductors material (14 marks)
2. a) With the aid of a labelled diagram, describe the formation of a PN junction. (6 marks)
- b) With the aid of a circuit diagram, explain the operation of a forward biased PN junction. (6 marks)
- c) Draw and explain the characteristic curve for a silicon based PN junction in forward and reverse biased mode. (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) Draw labelled circuit diagram showing how voltage can be doubled.
 - (ii) Explain the working of the circuit in (i). (11 marks)
 - (b) With an aid of a characteristic curve, explain the operation of a zener diode. (8 marks)
 - (c) State one application of a zener diode (1 mark)
- 5.
 - (a) With an aid to a labelled diagram, explain the operation of an LED. (6 marks)
 - (b) An LED with a forward voltage drop of 1.5V is connected across a 12 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 lamps. (3 marks)
 - (d) With an aid of a circuit diagram explain the working of an NPN transistor as an amplifier. (7 marks)