KIBABII UNIVERSITY
(KIBU)

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER MAIN EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF EDUCATION (SCIENCE)

COURSE CODE: SPH 327

COURSE TITLE: ELECTRONICS

TIME: 2 Hours

DATE: 5/10/2021   **TIME**: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES
Answer question ONE and any TWO of the remaining.
Symbols used bear the usual meaning.

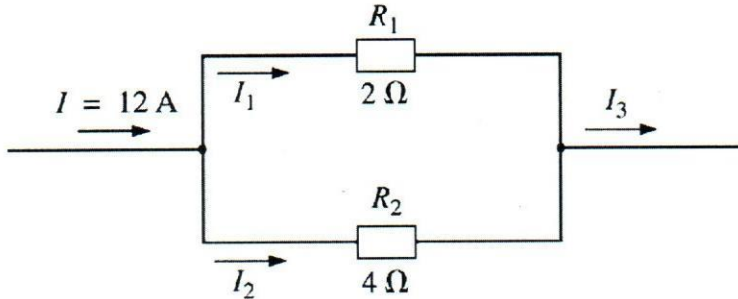KIBU observes ZERO tolerance to examination cheating

Useful constants $V_{BE} = 0.7V$

## QUESTION ONE (30 MARKS)

a) With examples, distinguish between active and passive devices   (2 marks)
b) Define the following terms (i) branch (ii) node and (iii) loop   (3 marks)
d) State Kirchhoff's laws.   (2marks)
c) Use current divider rule to determine I_1 and I_2 in the following circuit.   (2 marks)

d) Define doping?   (1 marks)
e) Use band gap theory to explain the difference between conductors, insulators and
   semiconductors.   (6 marks)
f) Explain the working principle of Zener diode. Draw its characteristics.   (4 marks)
g) Define energy bands, electrons and holes as used in semiconductor physics   (3marks)
g) Derive the relationship between α and β giving their respective meaning.   (2 marks)
h) Draw a n-p-n transistor connected in Common emitter configuration showing clearly all the
   current directions.   (3 marks)
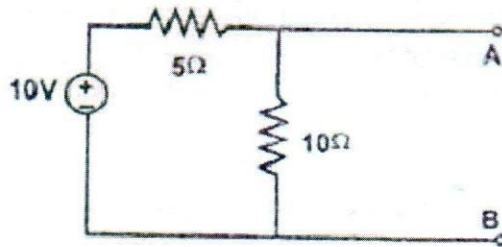i) Differentiate between intrinsic and extrinsic semiconductors   (2 mark)

QUESTION TWO (20 MARKS)
a) State and explain the function and application of diode clipper using a suitable diagram.
   (6 marks)

b) Determine I_B, I_C, I_E, V_{CE} and V_{CB} in the circuit below. The transistor has a $\beta = 150$. (8 marks)

DC
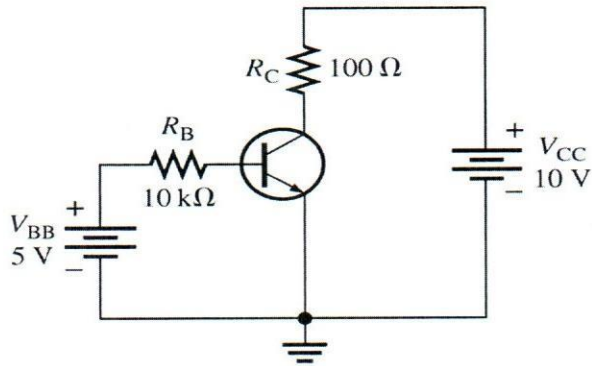
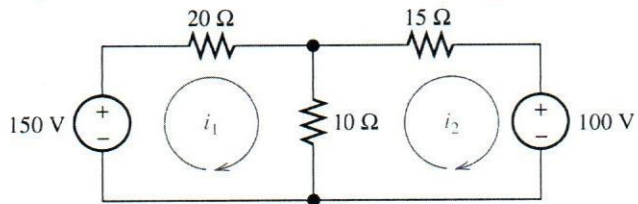(c) Use Norton's theorem to find short AB and $R_N = R_{TH}$. (6 marks)

QUESTION THREE (20 MARKS)

a) Use Mesh Current Analysis to find I_1 and I_2 in the following circuit (7 marks)

b) Describe how to obtain the input and output characteristics of common emitter npn transistor (Use a clear circuit diagram to illustrate your answer). (5 marks)

c) For a transistor connected in common emitter configuration, sketch the typical output characteristics relating collector current and the collector-emitter voltage, for various values of base current. Explain the shape of the characteristics. (8 marks)
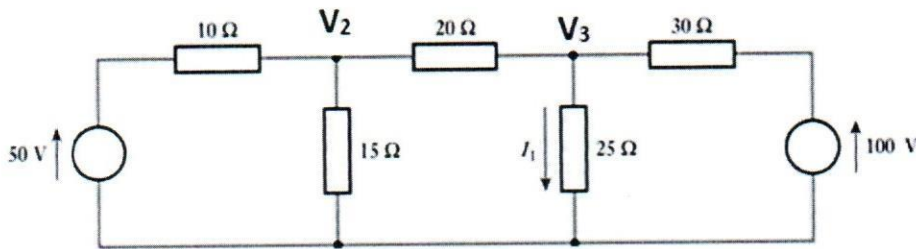
QUESTION FOUR (20 MARKS)

a) Consider the circuit shown, where $_1 = 20\Omega$, $R_2 = 40\Omega$, $V_1 = 20V$. Calculate (a) The current through R_1. (b) The current through R_2. (c) The current leaving the voltage source. (6 marks)
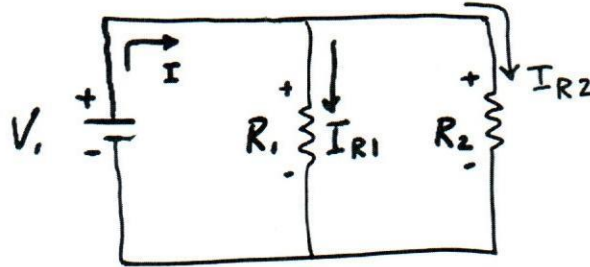
b) Briefly explain with a suitable diagram how D.C load line can be determined from a BJT characteristic curve. (7 marks)

c) c) Use Nodal analysis to determine the current I_1 in the following circuit. (7 marks)

QUESTION FIVE (20 MARKS)

a) Describe the operation of PN junction diode under forward and reverse bias. (4 marks)

b) Describe experiments to determine transistor characteristics (2marks)

c) Explain applications of diodes and transistors (2marks)

d) Using Thevenin's Theorem, determine V_o across parts A and B. (6 marks)
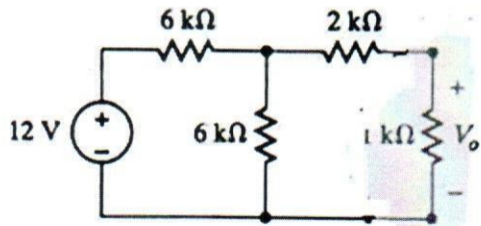
e) Explain clearly with suitable waveforms, the working of a half wave rectifier. (6 marks)