KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OFBSC (PHYSICS)

COURSE CODE: SPC223

COURSE TITLE: ELECTRONICS I

DURATION: 2 HOURS

DATE: 9/2/2021 **TIME:**2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.

Start every question on a new page and make sure question's number is written on each page
This paper consists of **3** printed pages. Please Turn Over

QUESTION ONE (30mks)

a) Differentiate between active and passive elements. Give an example in each case. (2mks)

b) Distinguish between *constant voltage source* and *constant current source*. (2mks)

c) A lead acid battery fitted in a truck develops 24V and has an internal resistance of 0.01 Ω. It is used to supply current to head lights etc. If the total load is equal to 100 watts, find:

(i) Voltage drop in internal resistance (2mks

(ii) Terminal voltage (2mks)

d) Compute the current in the 23-Ω resistor of Fig1(a) by applying the superposition principle.(6mks)

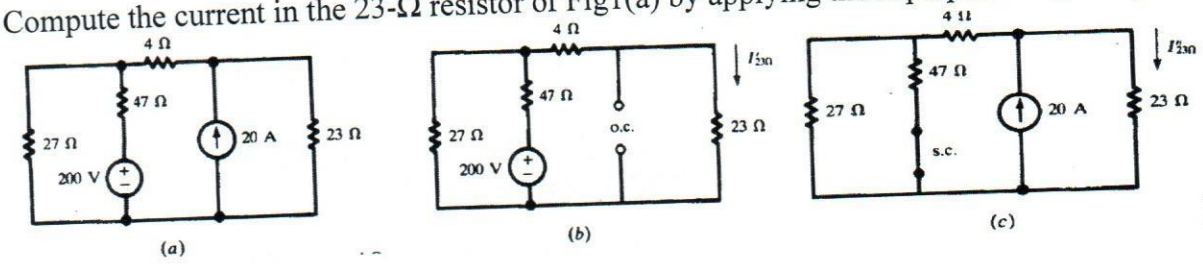


Fig. 1

e) State Thevenin'sTheorem (1mk)

f) Define the term doping (1mk)

g) Compare the forward bias characteristics for silicon and Germanium indicating the knee voltage (2mks)

h) Consider Figure 2 below with the following Parameters: $V_1 = 15V$, $V_2 = 7V$, $R_1 = 20\Omega$, $R_2 = 5\Omega$, $R_3 = 10\Omega$. Find current through R_3 using Kirchhoff's Voltage Law. (4mks)

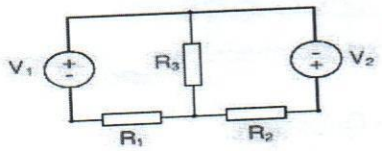


Figure 2

i) A transistor is connected in common emitter (CE) configuration in which collector supply is 8V and the voltage drop across resistance R_C connected in the collector circuit is 0.5V. The value of $R_C = 800\ \Omega$. If $\alpha = 0.96$, determine:

(i) collector-emitter voltage (2mks)

(ii) base current (2mks)

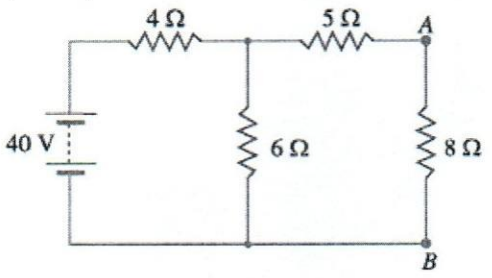
j) Draw circuit symbols to differentiate between npn and pnp transistors (2mks)

k) Distinguish between intrinsic and extrinsic semiconductors. (2mks)

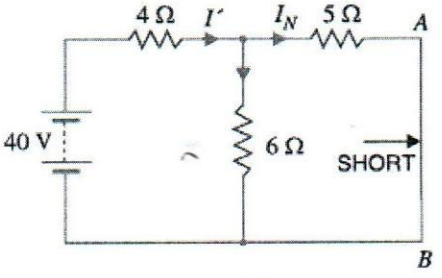
QUESTION TWO (20mks)

a) State Norton's theorem (2mks)

b) Using Norton's theorem, find the current in 8 Ω resistor in the network shown in Fig3 (i). (8mks)



(i)



(ii)

Figure 3

c) Solve the circuit in Fig 4 using

i) Branch current method (5mks)

ii) The node voltage method. (5mks)

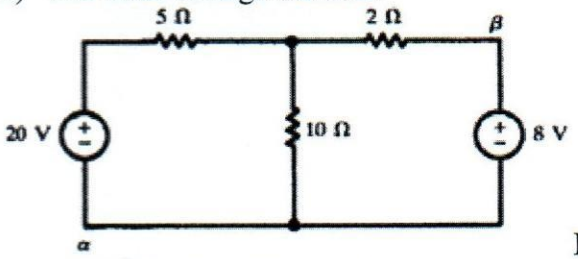
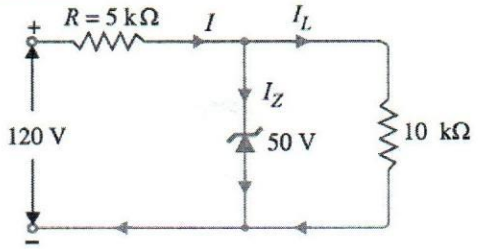


Fig 4

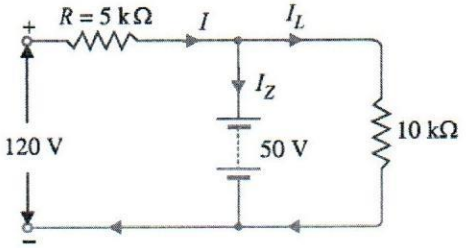
QUESTION THREE (20mks)

a) State any three advantages of light-emitting diode (LED) (3mks)

b) For the circuit shown in Fig. 6 (i), find:
(i) the output voltage (ii) the voltage drop across series resistance (iii) the current through Zener diode. (7mks)



(i)



(ii)

Fig 6

c) Fig. 7 shows the basic photo-diode circuit. Describe how it operates and explain its two important characteristics (10mks)

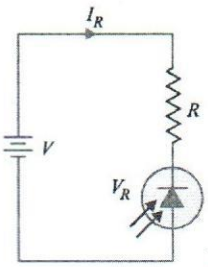


Fig 7

QUESTION FOUR (20mks)

a) Mention the applications of CE, CB and CC configurations of BJT's (6mks)

b) Differentiate between FET and BJT transistors (8mks)

c) Draw the three configurations in which a transistor may be connected showing battery Connections for each (6mks

QUESTION FIVE (20mks)

a) Outline any three properties of semiconductors (3mks)
b) Based on Energy band theory, materials are broadly classified. State and explain the classifications (6mks)
c) Describe the process of full wave rectification using a bridge circuit (6mks)
d) Draw the circuit diagram for a full wave rectifier using centre tapped transformer (3mks)
e) Explain the term depletion layer as used in semiconductors (2mks)

END