KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
SUPPLEMMENTARY EXAMINATIONS

FOR THE DEGREE OF BED (SC) & BSC (PHYSICS)

COURSE CODE: SPC 223

COURSE TITLE: ELECTRONICS I

DURATION: 2 HOURS

DATE: 21/1/2022 **TIME: 8-10AM**

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) State Norton Theorem (1mk)

b) Define the term forbidden gap (2mks)

c) State three disadvantages of Centre tapped full –wave rectifier (3mks)

d) State two advantages of C-Filter (2mks)

e) Copper has 8.0×10^{28} conduction electrons per metre cubed. A copper wire of length 1m and cross-sectional area 8.0×10^{-6} m^2 carrying a current and lying right angles to a magnetic field of strength 5.0×10^{-3} T experiences a force of 8.0×10^{-2}N. What is the drift velocity of the free electrons in the wire? (3mks)

f) Distinguish between *ideal voltage source* and *ideal current source*. (2mks)

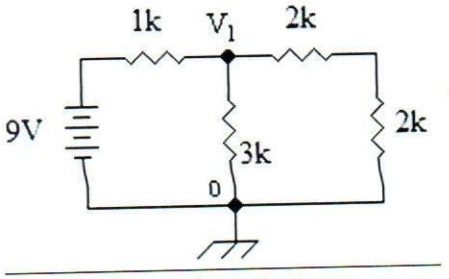
g) State Kirchhoff's laws (2mks)

h) A voltage divider circuit of two resistors is designed with a total resistance of the two resistors equal to 50.0Ω. If the output voltage is 10 percent of the input voltage, obtain the values of the two resistors in the circuit. (3mks)

i) An LED is constructed from a p-n junction based on a certain Ga-as-s semiconducting material whose energy gap is 1.9eV. What is the wavelength of the emitted light? (take $h = 6.26 \times 10^{-34}$ J.s and speed of light, $c = 3 \times 10^8$ m/s) (3mks)

j) Give two reasons why CE configuration is normally preferred in transistor connection. (2mks)

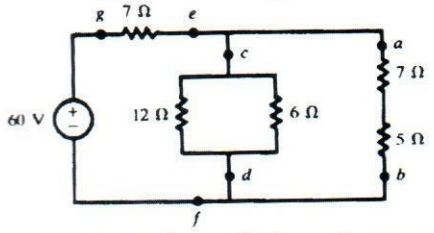
k) Given the Circuit below, find the voltages at all nodes (4mks)



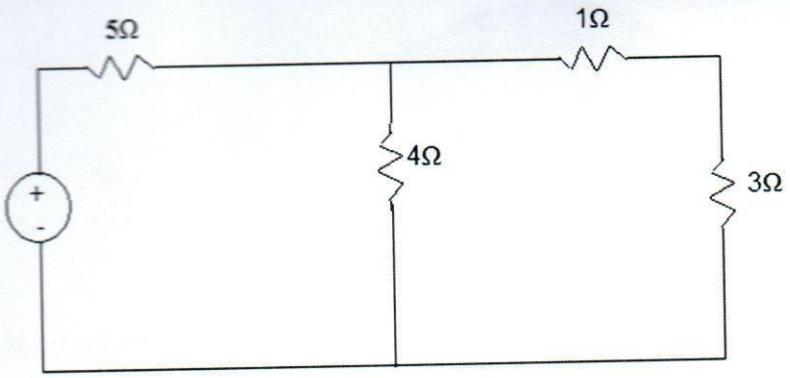
l) Distinguish between intrinsic and extrinsic semiconductors (3mks)

QUESTION TWO (20mks)

a) Obtain the total power supplied by the 60-V source and the power absorbed in each resistor in the network of Figure below. (14mks)



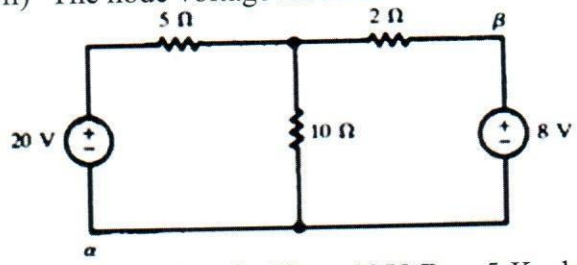
b) The figure below shows a resistor network connected to a 28V d.c supply.



(i) Determine the Thevinin Voltage across the 3Ω resistor. (4mks)
(ii). Sketch the Thevinin equivalent circuit. (2mks)

QUESTION THREE (20mks)

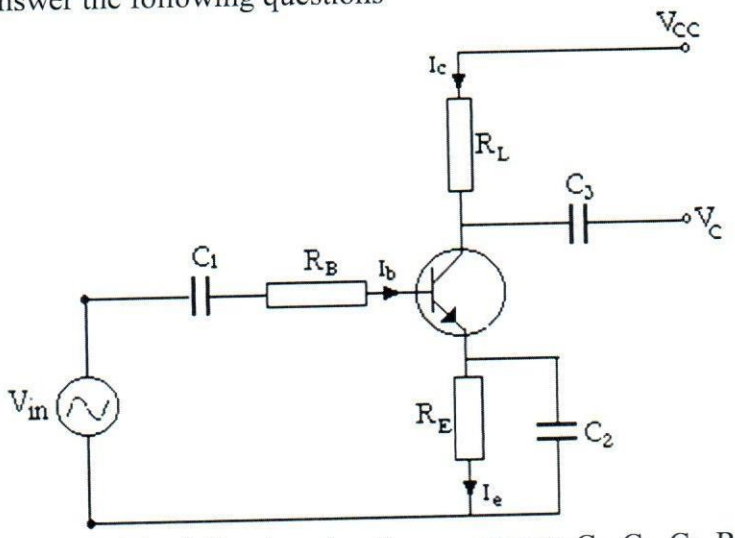
Solve the circuit below using
i) Branch current method (7mks)
ii) The node voltage method. (7mks)



b) In a circuit, $V_{CC} = 10\,V, R_c = 5\,K$; do the following
i. Draw a D.C. load line (2marks)
ii. Find the coordinates of Q- point at $I_B = 10\,\mu A$ and $\beta = 70$. (4marks)

QUESTION FOUR (20mks)

Use the circuit below to answer the following questions



a) What is the function of each of the following circuit components: C_1, C_2, C_3, R_L, R_B. (4mks)

b) Calculate I_e, I_c, I_b, V_C, V_E and V_{CE} if $R_B = 1M\Omega$, $V_{BB} = 30V$, $V_{CC} = 30V$, $R_E = 10K\Omega$, $R_C = 5K\Omega$ and $\beta =$ 100. (6mks)

c) Briefly explain how you would use a transistor as a switch (5marks)
d) Describe the process of full wave rectification using a bridge circuit (5mks)

QUESTION FIVE (20mks)

a) Distinguish between Avalanche breakdown and Zener breakdown (6mks)
b) Based on Energy band theory, materials are broadly classified. State and explain the classifications (9mks)
c) Highlight any two applications of LEDs in electronic circuitry. (2mks)
d) Briefly explain how a photo-diode works. (3mks)