University of Ruhuna- Faculty of Technology
Bachelor of Biosystems Technology Honours Degree
Level 1 (Semester II) Examination, December 2022
Academic year 2020/2021

Course Unit: BST1222 Electronics for Bio-System Technology (Written)   Duration: 1.5 hours

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- All symbols have their usual meanings.
- Answer all **Four (04)** questions.
- Calculators are **allowed** for this examination.

Question 1 (25 marks)

1. Define the following terms.
    - I.   Voltage
    - II.   Current
    - III. Resistance   (3 marks)

2. Briefly explain following terms associated with a circuit.

    - I.   Branch
    - II.   Node
    - III. Loop   (3 marks)

3. An electrician wishes to cut a copper wire ($\rho=1.724 \times 10^{-8}\Omega m$) that has no more than 10Ω of resistance. The wire has a radius of 0.725mm. What would be the approximate length of the wire that has a resistance equal to the maximum 10Ω?
                                                                          (5 marks)

4. Draw V – I diagrams for following.
    - I.   An ideal constant voltage source
    - II.   An ideal constant current source   (4 marks)

5. Calculate the power dissipation through the resistor in the circuit shown in Figure 1.
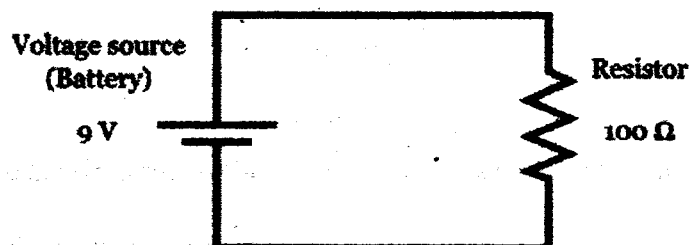   (5 marks)

Voltage source (Battery)   9 V

Resistor   100 Ω

Figure 1

6. Briefly explain how non ideal circuit elements differ from ideal circuit elements.

(5 marks)

Question 2 (25 marks)
1. Briefly explain the following
   I. Ohm's Law
   II. Kirchhoff's Current Law
   III. Kirchhoff's Voltage Law

(3 marks)

2. The current passing through a resistor in a circuit is 0.01 A when the voltage across the same resistor is 5 V. What would be the current passes through this resistor when the voltage across it is 7.5 V?

(6 marks)

3. Provide answers to following questions based on the circuit shown in Figure 2.
   I. Find the current passing through R1, R2, R3, R4
   II. Find the nodal voltages at point A, B and C.
   III. If R3 and R4 resistors are replaced with two identical bulbs with same resistance of 2 kΩ, which bulb will glow brighter?
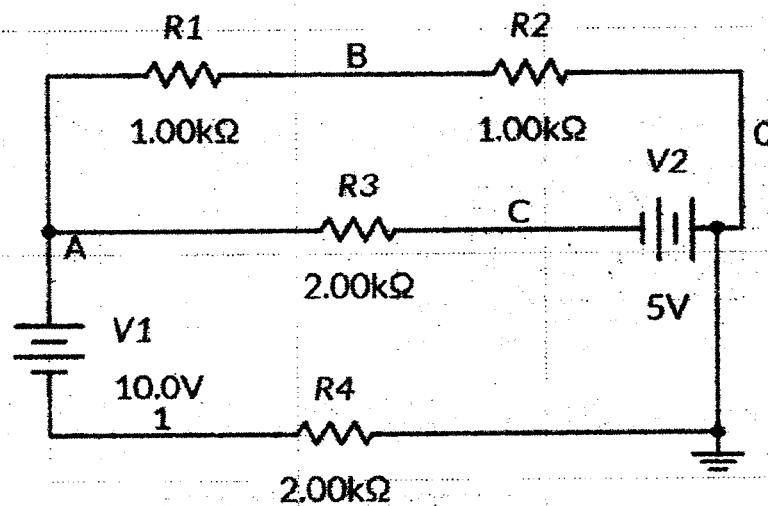
(16 marks)

Figure 2

Question 3 (25 marks)

1. What does it mean by a forward biased diode and a reverse biased diode?

(2 marks)

2. Draw characteristic curve of a P-N Junction and clearly mark the following areas
   I. Forward Operating Region
   II. Reverse Operating Region
   III. V_{KNEE}

IV.   Leakage Current

(6 marks)

3. Draw the V-I characteristic of constant voltage drop model of a diode.

(4 marks)

4. What is a Zener diode?

(2 marks)

5. Answer the following questions referring to the circuit diagram shown in Figure 3. Where D1 is a germanium diode and D2 is a silicon diode. For silicon the threshold voltage is 0.7V and for germanium it is 0.3V. The voltages at point A and B are + 16V and -8V respectively.

I.   Calculate the voltage difference between A and B.
II.   Find the current flowing through R1 and R2
III.   Find the output voltage (V_o)

IV.   What will happen to the current flow if Ge diode is replaced with a Silicon diode
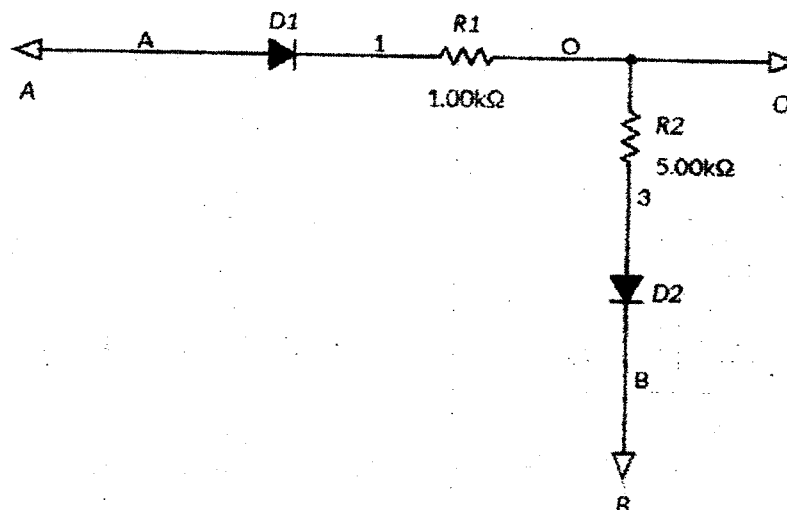
(11 marks)

Figure 3

Question 4 (25 marks)

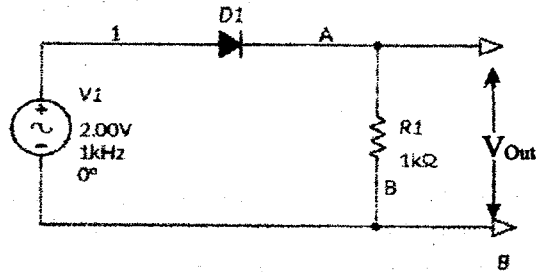1. Write three applications of operational amplifiers?

(3 marks)

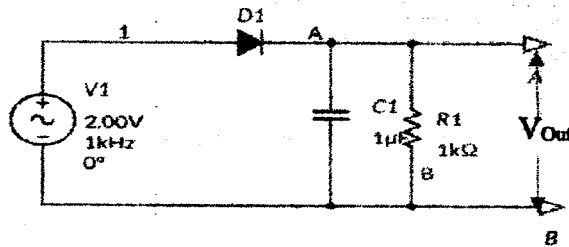2. Write down the main components of the transformation of AC power supply to DC power supply?

(3 marks)

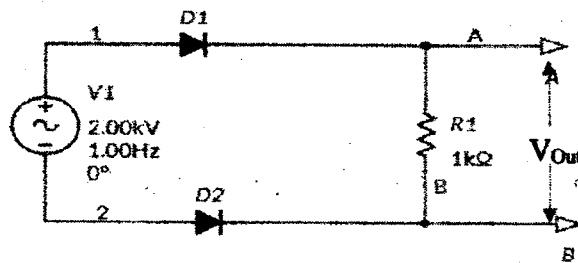3. Draw V_{out} Vs t diagram for the given circuits.

I.

II.

III.

(6 marks)

4. Determine the following parameters of the given circuit in Figure 4.
   - I. V_B
   - II. V_E
   - III. I_E
   - IV. I_C
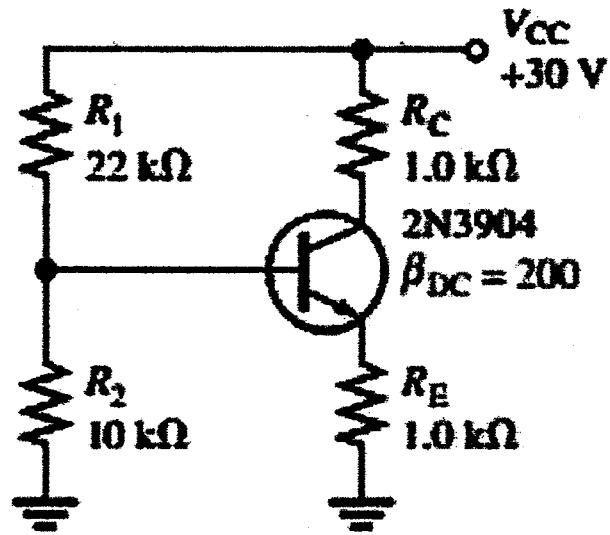   - V. I_B
   - VI. V_C
   - VII. V_{CE}

(13 marks)

Figure 3

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