CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

JUNE XXXX **INTERMEDIATE LEVEL**

Subject Title	**ELECTRONIC CIRCUITS**
Subject Code No.	**5255**
Paper No.	**TWO**

Duration: Three Hours

Section A has **FOUR** questions. **Answer question one and any two questions**.

Section B has **TWO** questions. **Answer one question in this section**.

Show all the steps in your calculations giving your answer at each stage and indicating the units and symbols used.

All sketches must be neat and clear.

You are allowed to use calculators and mathematical sets

You are reminded of the necessity for good English and orderly presentation in your answers.

SECTION A : ANALOGUE ELECTRONICS

Answer question 1 and any two questions

1. CIRCUIT ANALYSIS

Consider the circuit of figure 1

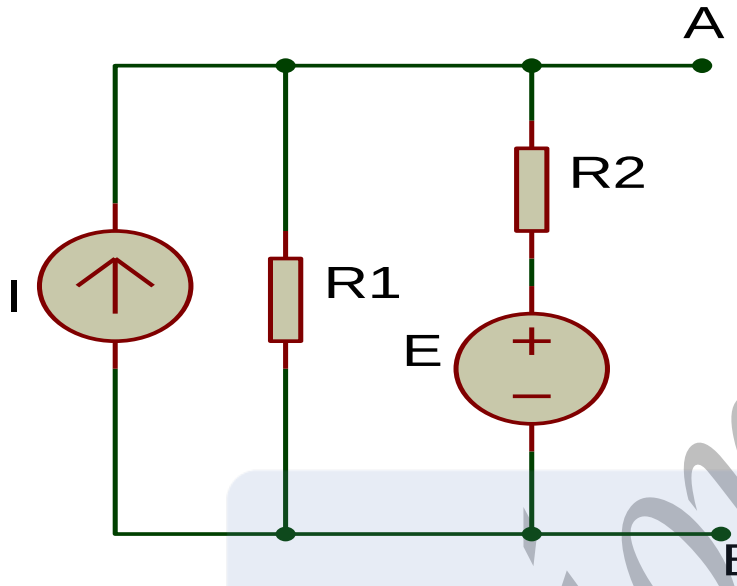

Figure 1

The values of the circuit elements are E = 48V ; R1 = 24Ω ; R2 = 12Ω ; I = 1A.

1.1 State Milman's theorem. **(3 marks)**

1.2 Use Milman's theorem to calculate the open circuit voltage seen between the A – B terminals. **(5 marks)**

1.3 Calculate the resistance seen between the A – B terminals. **(5 marks)**

1.4 If a load RL = 8Ω is connected across the A – B terminals, calculate

1.4.1 the current flowing through the load, **(4 marks)**

1.4.2 the power dissipated by the load, **(4 marks)**

1.4.3 Explain whether maximum power is transferred to the load. **(4 marks)**

(Total = 25 marks)

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2. Diode Circuit

The values of the elements of the circuit in figure 2 are E = 5V; R1 = 33Ω; R2 = 22Ω; V_D = 600mV. Find:

2.1 The current I_2. **(5 marks)**

2.2 The current I_1. **(5 marks)**

2.3 Deduce the value of the current I_D. **(5 marks)**

2.4 The power dissipated by the diode. **(5 marks)**

2.5 If R2 is disconnected from the circuit, deduce the value of the current I_D. **(5 marks)**

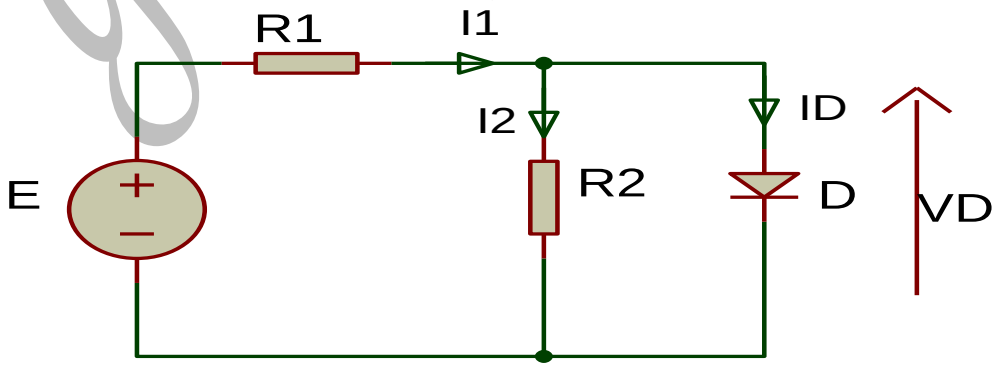

Figure 2

(Total = 25 marks)

3. BIPOLAR JUNCTION TRANSISTOR(BJT)

The values of the circuit elements are V_{BE0} =700mV; R_B = 2.7MΩ; R_C = 2.7KΩ; β = 350; V_{CC} = 12V.

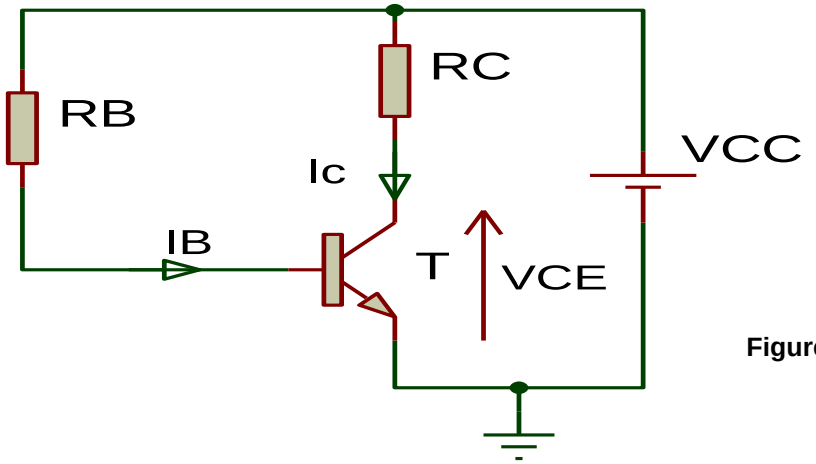

Figure 3

3.1 Identify the type of the transistor biasing used in figure 3. **(2 marks)**

3.2 Give the role of the resistor RB. **(2 marks)**

3.3 Write the expression for the quiescent base current I_{B0} and calculate its value. **(5 marks)**

3.4 Deduce the value for the quiescent collector current I_{C0}. **(4 marks)**

3.5 Write the expression for V_{CE0} and calculate its value. **(4 marks)**

3.6 Calculate the power P_T dissipated by the transistor. **(4 marks)**

3.7 Deduce the operating mode of the transistor. **(4 marks)**

(Total = 25 marks)

4. OPERATIONAL AMPLIFIER

The operational amplifier used in figure 4 is ideal.

4.1 Name **two** characteristics of an ideal operational amplifier. **(2 marks)**

4.2 Write the expression for I_1 in terms of V1, R1 and e-. **(5 marks)**

4.3 Write the expression for I_2 in terms of V2, R1 and e-. **(5 marks)**

4.4 Write the expression for I_0 in terms of e-, RF and Vo. **(5 marks)**

4.5 If R1 = R2 = RF, write the expression for Vo in terms of V1 and V2. **(5 marks)**

4.6 Deduce the name of the operational amplifier circuit. **(3 marks)**

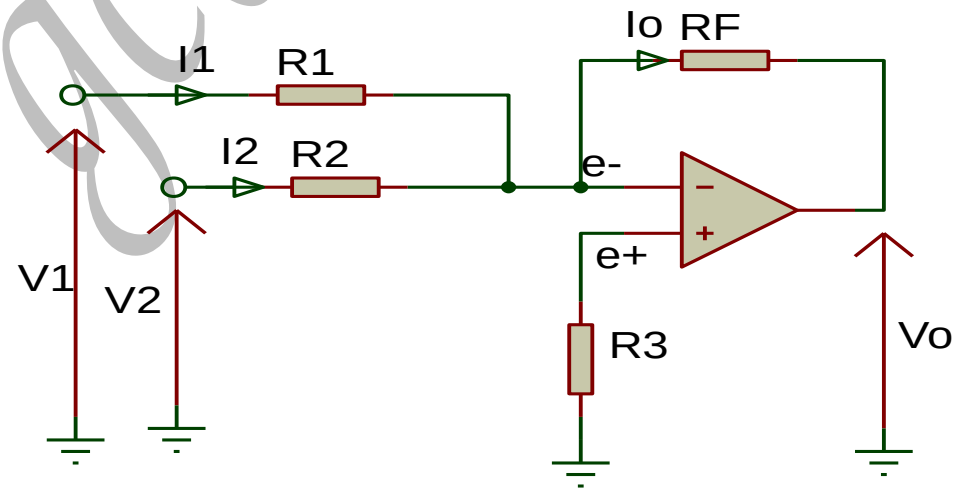

Figure 4

(Total = 25 marks)

SECTION B: DIGITAL ELECTRONICS
Answer one question in this section

5. Combinational logic

5.1 Perform the following operation

a. $(10011011 + 10011101)_2$ **(2 marks)**

b. $(ABC + DEF)_{16}$ **(2 marks)**

c. $(1001001110)_2 = (\text{----------})_8$ **(2 marks)**

d. $(11001110100)_2 = (\text{----------})_{Gray}$ **(2 marks)**

5.2 The logic cicuit of figure 1 is used to contol an alarm located at point X

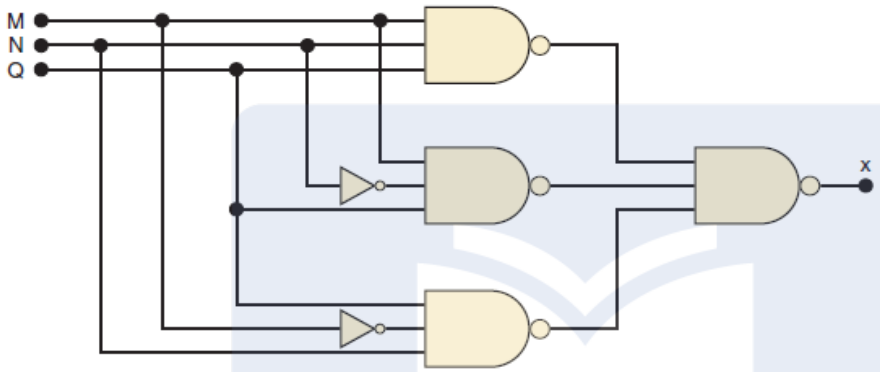

Figure 5

a) Write the sum-of-product expression of the output X. **(4 marks)**

b) Construct the truth table of the function X. **(4 marks)**

c) Use Boolean algebra to simplify X. **(4 marks)**

d) Draw the logic circuit of the simplified output using two input gates only. **(5 marks)**

(Total = 25 marks)

6. Sequential logic

Consider the circuit below.

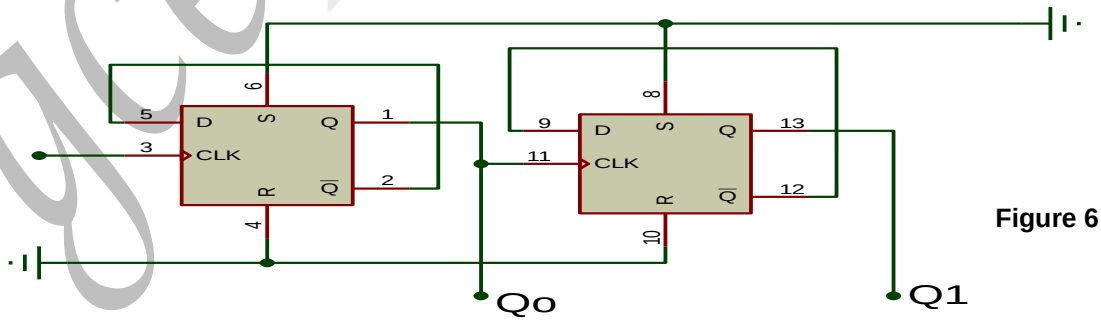

Figure 6

6.1 Identify the type of counter implemented in figure 2 above. **(3 marks)**

6.2 Give the operating mode of the flip flop used in this system. **(3 marks)**

6.3 Construct the truth table of the counter. **(5 marks)**

6.4 Draw the timing diagram of the counter. **(6 marks)**

6.5 If the frequency of the clock signal is 100KHz, calculate the frequency at

6.5.1 the Q_0 output, **(4 marks)**

6.5.2 the Q_1 output. **(4 marks)**

(Total = 25 marks)
