

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examinations



ELECTRICAL POWER SYSTEMS

ELECTRICAL AND ELECTRONIC CIRCUITS 2
5240

JUNE XXXX

INTERMEDIATE LEVEL

Subject Title	ELECTRICAL AND ELECTRONIC CIRCUITS
Subject Code No.	5240
Paper No.	TWO

THREE HOURS

Answer FOUR questions choosing any TWO from section A and any TWO from Section B.

Weighting of this paper is 35 percent of the whole subject.

Show all 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 non-programmable calculators and mathematical sets

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

Turn Over

SECTION A: ELECTRICAL CIRCUITS

1. Consider the circuit diagram in the Figure 1 below;

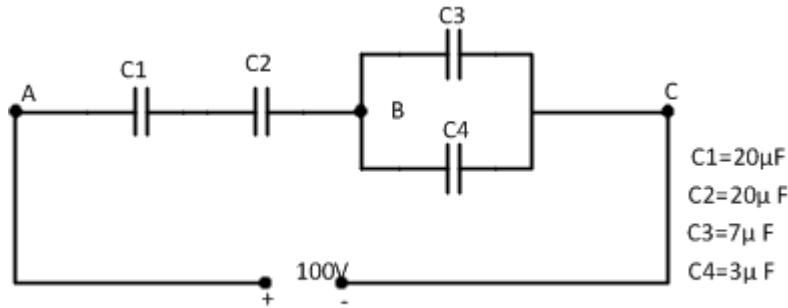


FIGURE 1

- | | |
|---|----------|
| (a) Calculate the equivalent circuit capacitance C_T | (5marks) |
| (b) Deduce the total charge in the circuit | (5marks) |
| (c) Calculate the charge through each capacitor | (5marks) |
| (d) What should be the new value of C_4 if now the equivalent capacitance is $5\mu\text{F}$ | (5marks) |
| (e) If $C_T=5\text{F}$, what is the total charge in the circuit | (5marks) |

2. A resistance of 50Ω , inductance of 300mH and a capacitance of $50\mu\text{F}$ are connected in series across an ac source of value $v(t) = 220\sqrt{2}\sin(314t)$ volts.

- | | |
|--|----------|
| (a) Draw the diagram of the circuit described. | (2marks) |
| (b) Determine; | |
| (i) Frequency | (1mark) |
| (ii) Pulsation | (1mark) |
| (iii) RMS value of the supply voltage | (1mark) |
| (iv) The maximum value of the supply voltage | (1mark) |
| (v) Total reactance of the circuit | (2marks) |
| (vi) Total impedance of the circuit | (2marks) |
| (vii) The power factor of the circuit | (2marks) |
| (viii) Current flowing in the circuit | (2marks) |
| (ix) The current flowing in the circuit | (2marks) |
| (x) Active, reactive and apparent power of the circuit | (4marks) |
| (c) Draw the phasor diagram of the circuit | |
| | (3marks) |
| (d) At which frequency will resonance occurs | (2marks) |

3.

- (a) Determine the value of the load resistance R_L from the circuit in Figure 2 below required for maximum power to be transferred from the source to the load **(6marks)**

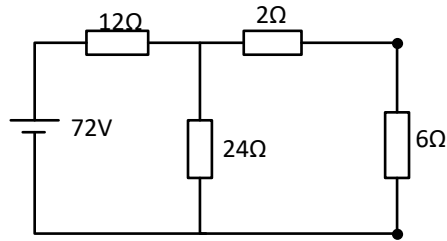


Figure 2

- (b) A coil which has a resistance of 10Ω and inductance 50mH is connected to a 230V , 50Hz supply. Calculate
- The total impedance of the circuit **(6marks)**
 - The current flowing through the circuit **(2marks)**
- (c) Consider the resistive circuit of the Figure 3 below

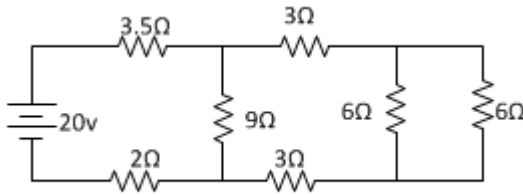


Figure 3

Calculate;

- The equivalent resistance of the circuit **(6 marks)**
- The current passing through each branch **(5 marks)**

SECTION B: ELECTRONIC CIRCUITS

4.

- (a) Consider the logic diagram in Figure 4 below;

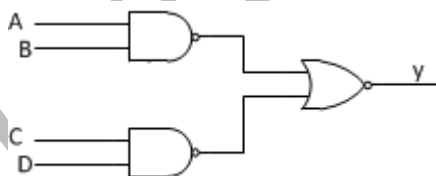


Figure 4

- Write out the logic equation of Y **(2marks)**
- Simplify the output equation algebraically **(4marks)**

(b) Consider the truth table below;

a	b	c	P
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

- (i) From the truth table, remove the logic equation of P (3marks)
- (ii) From the truth table, remove the logic equation of $\bar{P}$ (3marks)
- (iii) Simplify the logic equations of P and $\bar{P}$ using the Karnaugh map method (6marks)
- (iv) Draw the electrical or contact diagram of the following equation $H = \bar{a} + b.c$ (3marks)
- (v) Draw the logic diagram of the equation $L = a.\bar{c} + a.\bar{b}$ (4marks)

5.

- (a) Convert the following decimal numbers to octal
 - (i) 937_{10} (4 marks)
 - (ii) 783_{10} (4 marks)
- (b) Perform the following binary numbers
 - (i) $110011 + 101101$ (4 marks)
 - (ii) $1110 - 1101$ (4 marks)
- (c) Convert the following binary numbers to decimal:
 - (i) 1110011 (4 marks)
 - (j) 110011 (5 marks)

6.

- (a) Define a semiconductor (2marks)
- (b) Name and explain the two classes of semiconductor materials (4marks)
- (c) Enumerate any three components manufactured from semiconductor materials and give an application for each (6marks)
- (d) Draw a diagram of a single phase rectification circuit consisting of the following components;-Single phase transformer; 220/12V, 4 Diodes, Filtering capacitor, Resistive Load (6marks)
- (e) Draw the waveforms of; the supply voltage (V_s) after the transformer, the load voltage (V_R) without the filtering capacitor connected and the waveform of voltage (V_{R1}) across the load with the filtering capacitor connected. (7marks)