



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: BMT 1203
COURSE	: ELECTRICAL & ELECTRONICS
SEMESTER/SESSION	: 2-2024/2025
DURATION	: 3 HOURS

Instructions:

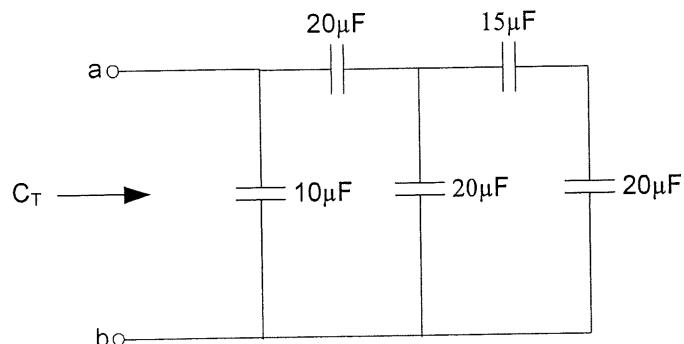
1. This booklet contains **4** questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 9 PRINTED PAGES INCLUDING COVER PAGE

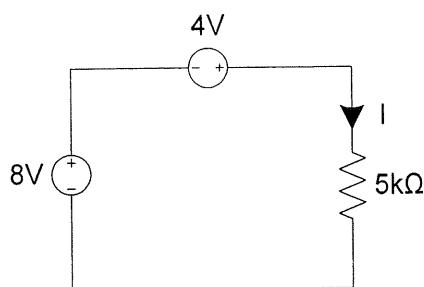
QUESTION 1

- a) State the function of the resistor. (1 mark)
- b) Draw the independent current source symbol. (2 marks)
- c) Find the current, I for 5 Coulomb of charge passes a wire within 5 seconds. (3 marks)
- d) Find voltage, V for 10 Joule of energy for every 20 Coulomb of charge. (3 marks)
- e) Find the energy stored in a 2V capacitor that stores $10\mu\text{C}$ of charge. (5 marks)
- f) Calculate the total capacitance, C_T for the circuit in Figure 1. (10 marks)

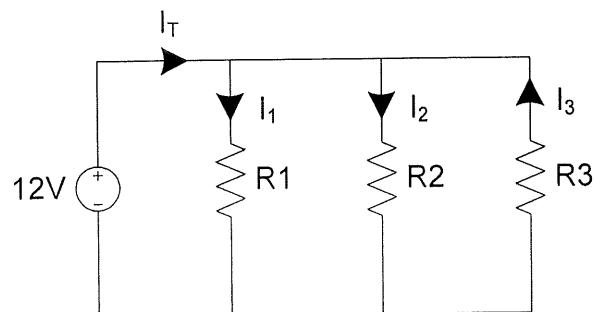
**Figure 1**

QUESTION 2

- a) Answer the following questions:
- Define Kirchoff Current Law (KCL). (1 mark)
 - Support your answer for question 2a(i) with an illustration. (1 mark)
- b) Refer to the circuit in Figure 2. Calculate the current, I using Kirchoff Voltage Law (KVL). (4 marks)

**Figure 2**

- c) Refer to the circuit in Figure 3. Calculate the total current, I_T using Kirchoff Current Law (KCL). Given that the current $I_1 = 4mA$, $I_2 = 4mA$ and $I_3 = 2mA$. (4 marks)

**Figure 3**

- d) Refer to the circuit in Figure 4. Calculate:
- i. Total resistance, R_T for the circuit. (4 marks)
 - ii. Total current, I_T flow through the circuit. (3 marks)
 - iii. The voltage across R_1 , V_1 . (3 marks)
 - iv. The voltage across R_3 , V_3 . (3 marks)

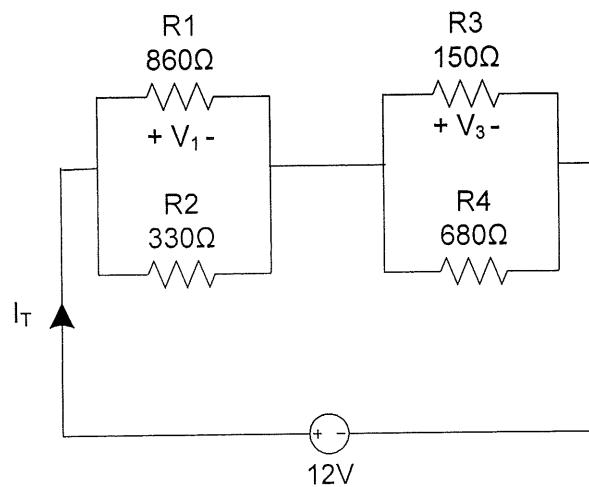
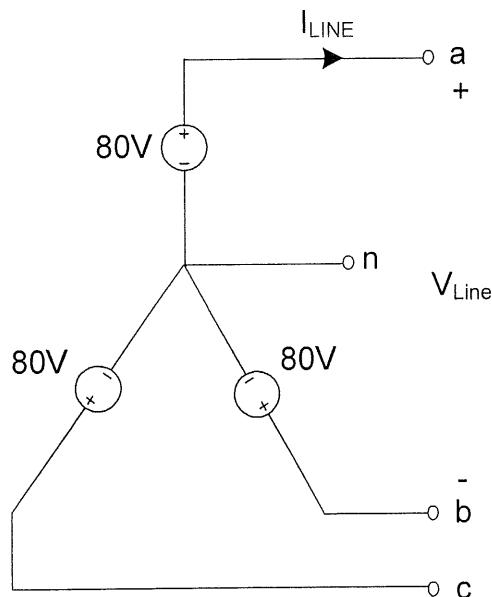


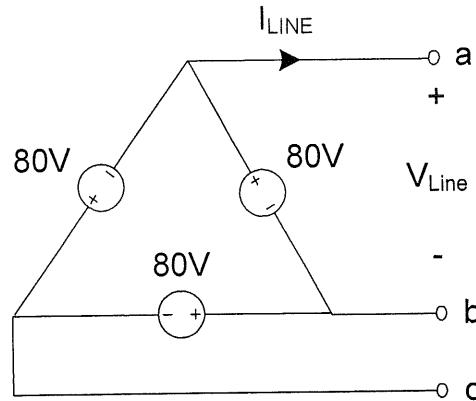
Figure 4

QUESTION 3

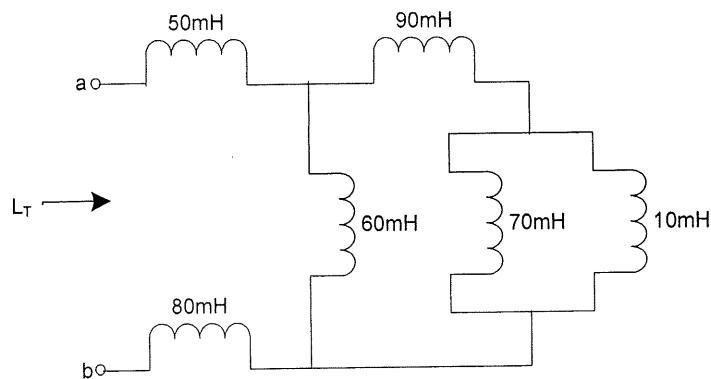
- a) List **ONE (1)** possible connection for the three phase system. (1 mark)
- b) Answer the following questions:
- Describe the single phase and three phase system. (2 marks)
 - Support your answer for question 3b(i) with an illustration. (2 marks)
- c) For the star connection shown in Figure 5, given phase voltage, $V_{phase} = 80V$ and phase current, $I_{phase} = 18A$. Calculate:
- Line voltage, V_{Line} . (3 marks)
 - Phase current, I_{Line} . (2 marks)

**Figure 5**

- d) For the delta connection shown in Figure 6, given phase voltage, $V_{phase} = 80V$ and phase current, $I_{phase} = 18A$. Calculate:
- Line voltage, V_{Line} . (2 marks)
 - Phase current, I_{Line} . (3 marks)

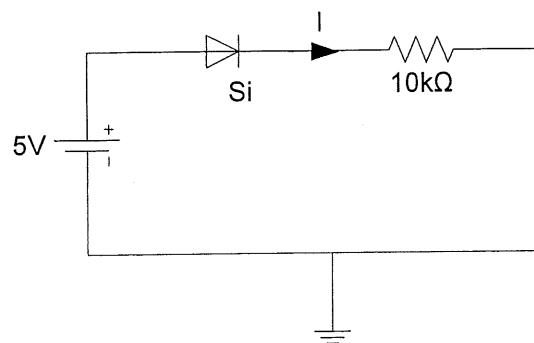
**Figure 6**

- e) Find the energy stored in a 12V inductor with the current of 3A. (5 marks)
- f) Calculate the total inductance, L_T for the circuit in Figure 7. (10 marks)

**Figure 7**

QUESTION 4

- a) State the definition of:
- i. Conductor (2 marks)
 - ii. Semiconductor (2 marks)
 - iii. Insulator (2 marks)
- b) State the **TWO (2)** types of biased conditions for diode operation. (2 marks)
- c) Draw the symbol of the diode with the label. (3 marks)
- d) Refer to the circuit in Figure 8. Calculate the current, I . (4 marks)

**Figure 8**

- e) Refer to the circuit in Figure 9. Assume $V_{BE} = 0.7V$ and $\beta_{DC} = 100$. Calculate:
- Base current, I_B . (4 marks)
 - Collector current, I_C . (2 marks)
 - Emitter current, I_E . (2 marks)

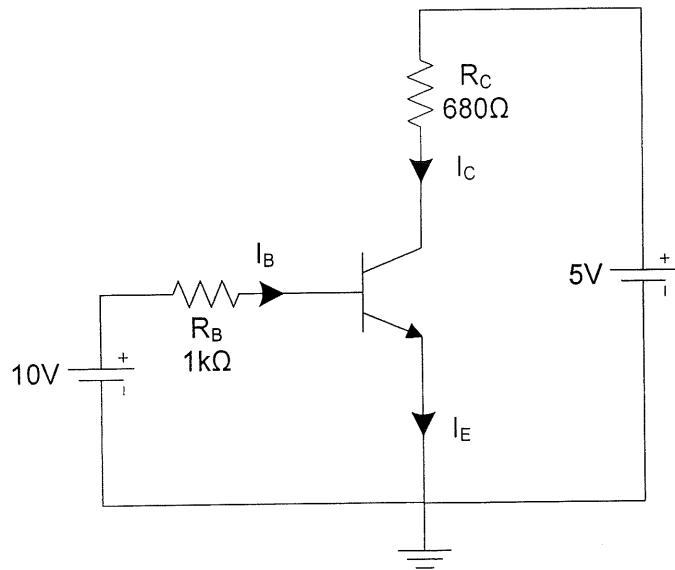


Figure 9

-----End of Question-----

APPENDIX 1

1.	Current	$I = \frac{Q}{t}$
2.	Voltage	$V = \frac{W \text{ (joules)}}{Q \text{ (coulombs)}}$
3.	Ohm's Law	$V = IR$
4.	Series Resistor	$R_{eq} = R_1 + R_2 + \dots + R_N$
5.	Parallel Resistor	$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_N}$
6.	Series Capacitor	$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_N}$
7.	Parallel capacitor	$C_{eq} = C_1 + C_2 + \dots + C_N$
8.	Series Inductor	$L_{eq} = L_1 + L_2 + \dots + L_N$
9.	Parallel Inductor	$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2} + \dots + \frac{1}{L_N}$
10.	Capacitance	$C = \frac{Q}{V}$
11.	Capacitor Energy	$W = \frac{1}{2} CV^2$
12.	Inductance	$L = \frac{V}{I}$
13.	Inductor Energy	$W = \frac{1}{2} LI^2$
14.	Transistor currents	$I_C = \beta I_B$ $I_E = I_C + I_B$
15.	Star Connection	$I_{Line} = I_{Phase}$ $V_{Line} = \sqrt{3} V_{Phase}$
16.	Delta Connection	$I_{Line} = \sqrt{3} I_{Phase}$ $V_{Line} = V_{Phase}$

