



## 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:

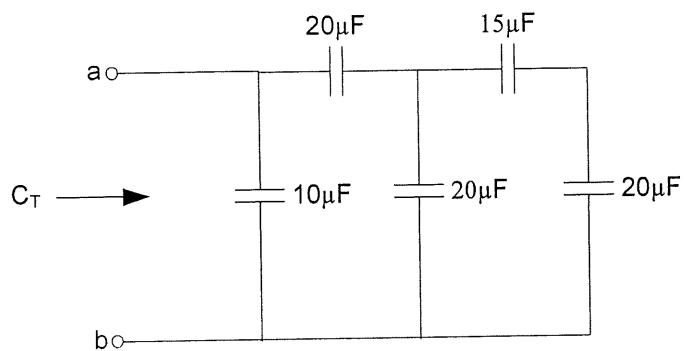
1. This booklet contains **4** questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

**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)

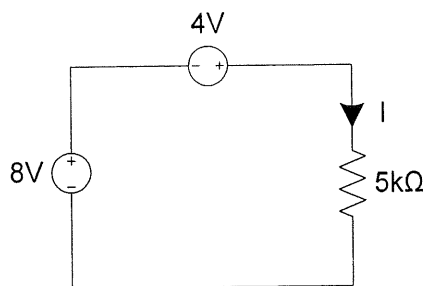
**Figure 1**

**QUESTION 2**

a) Answer the following questions:

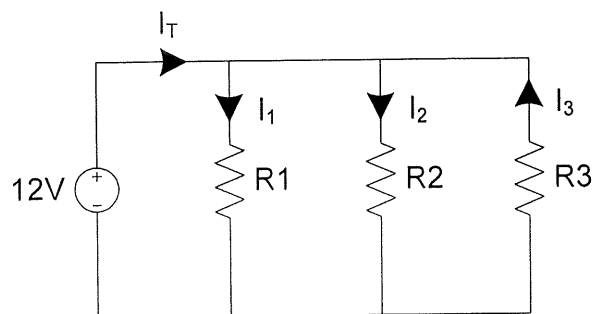
- Define Kirchhoff Current Law (KCL). (1 mark)
- Support your answer for question 2a(i) with an illustration. (1 mark)

b) Refer to the circuit in Figure 2. Calculate the current,  $I$  using Kirchhoff Voltage Law (KVL). (4 marks)



**Figure 2**

c) Refer to the circuit in Figure 3. Calculate the total current,  $I_T$  using Kirchhoff 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)

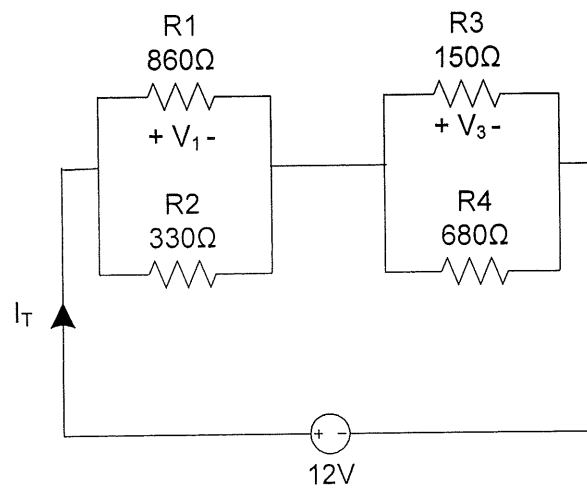
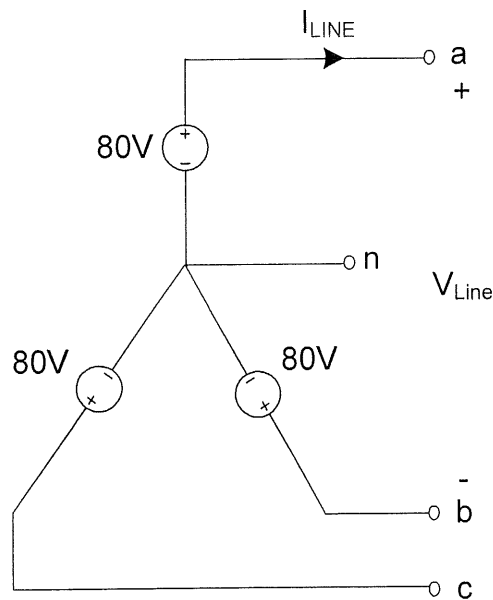


Figure 4

**QUESTION 3**

- a) List **ONE (1)** possible connection for the three phase system. (1 mark)
- b) Answer the following questions:
- i. Describe the single phase and three phase system. (2 marks)
  - ii. 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:
- i. Line voltage,  $V_{Line}$ . (3 marks)
  - ii. 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)

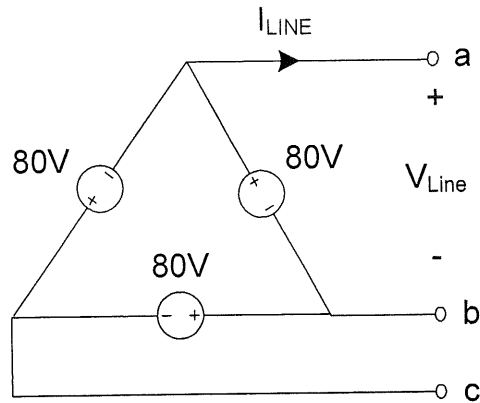


Figure 6

- 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)

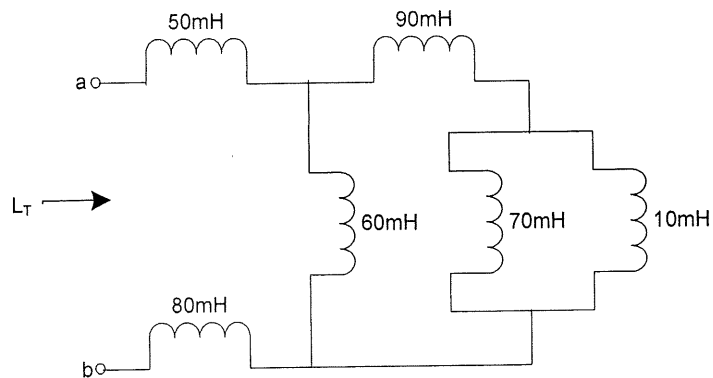
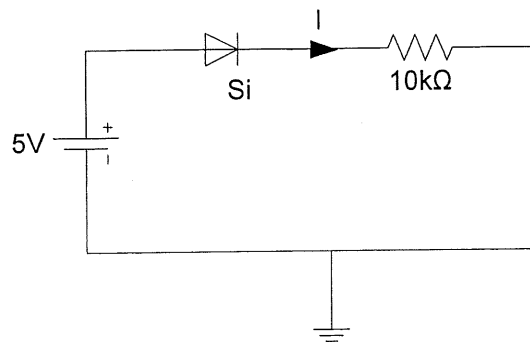


Figure 7

**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:
- i. Base current,  $I_B$ . (4 marks)
  - ii. Collector current,  $I_C$ . (2 marks)
  - iii. Emitter current,  $I_E$ . (2 marks)

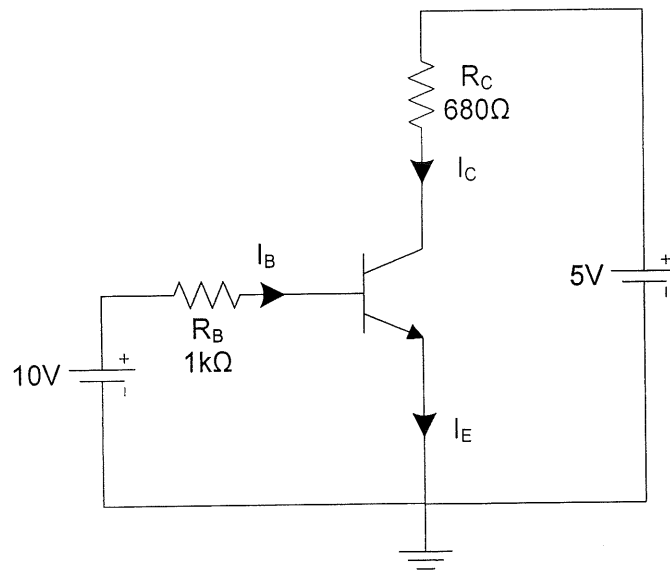


Figure 9

-----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	$I_{Line} = \sqrt{3} I_{Phase}$ $V_{Line} = V_{Phase}$

