UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BMT 1203
COURSE	: ELECTRICAL & ELECTRONICS
SEMESTER/SESSION	: 2-2021/2022 & 2-2022/2023
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 definition of electric current. (1 mark)

b) Determine the resistance and tolerance of the 4-band resistors with color of red, green, black and silver. (2 marks)

c) Determine the work done by a 10V battery in moving 5C charges from its positive to negative terminal. (2 marks)

d) Determine the current value if 10 coulomb of charge pass through a wire for 2 second. (2 marks)

e) Determine the resistance of a soldering iron that draws 1mA at 240V. (2 marks)

f) Determine the current, i_o in the **Figure 1**. (5 marks)

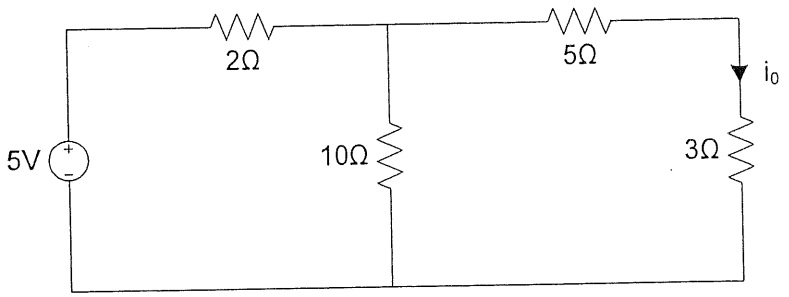

Figure 1

g) **Figure 2** shows a parallel circuit. Determine:

i. Total current, I_{TOTAL} flow through the circuit. (2 marks)

ii. The current I_1, I_2 and I_3. (9 marks)

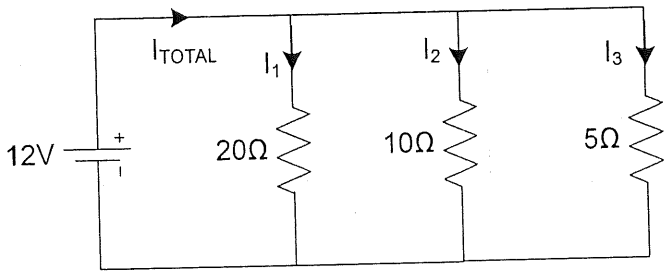

Figure 2

QUESTION 2

a) Answer following questions.

i. Define Kirchoff Current Law (KCL). (1 mark)

ii. Support your answer for question 2a(i) with an illustration. (2 marks)

b) Refer to **Figure 3**. Complete the output timing diagram, Z in **Figure 4** with A and B as the input signal. (4 marks)

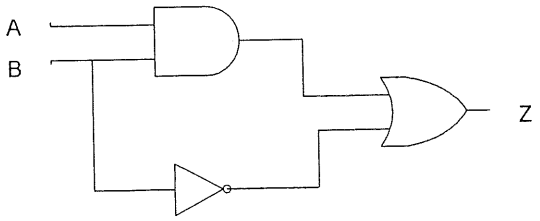

Figure 3

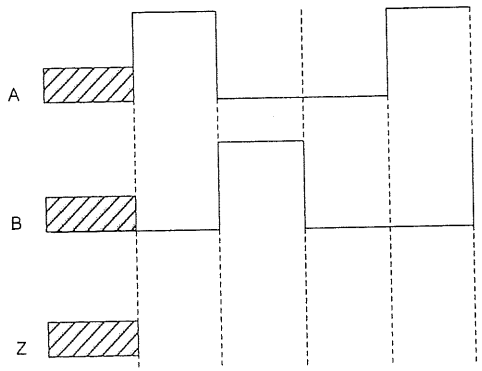

Figure 4

c) Draw the logic circuit for expression $F(X,Y,Z) = XZ + Y\bar{Z} + \bar{X}YZ$. (4 marks)

d) For each circuit in **Figure 5** and **Figure 6**, determine the total inductance, L_{TOTAL}.

(14 marks)

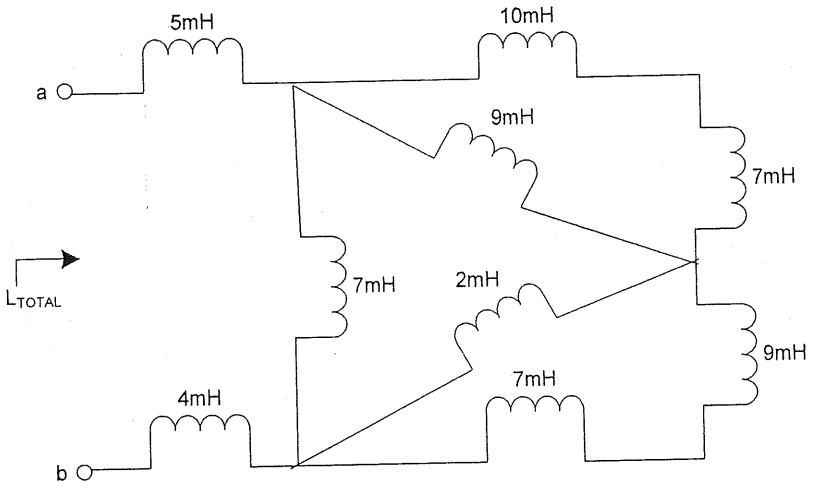

Figure 5

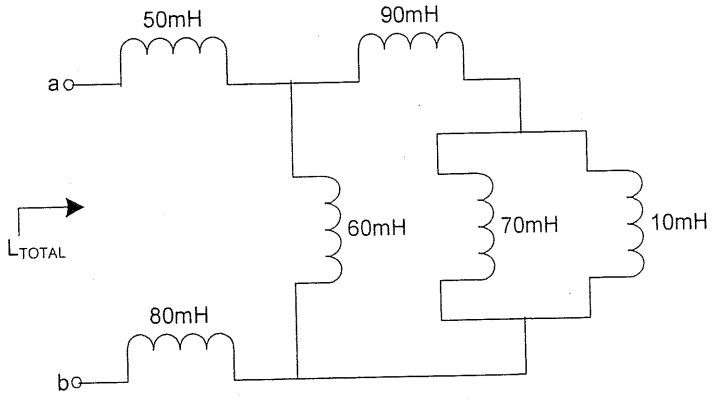

Figure 6

QUESTION 3

a) State the type of biased condition shown in **Figure 7**. (1 mark)

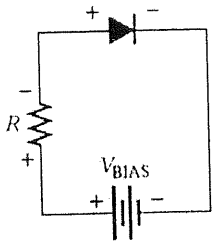

Figure 7

b) Determine the current, I for each circuit in **Figure 8** below. (6 marks)

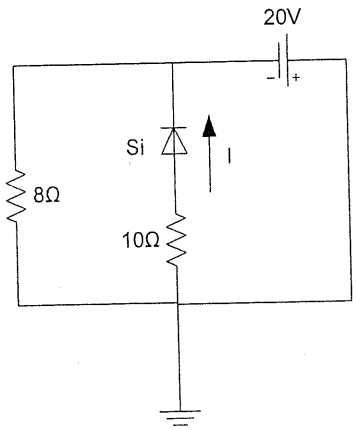

Figure 8 (i)

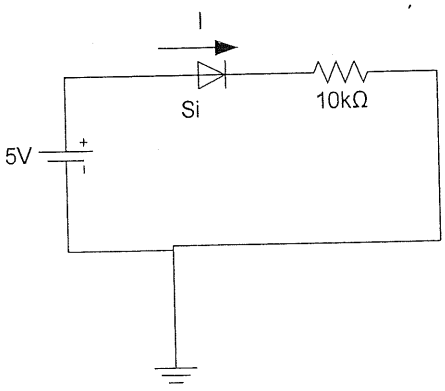

Figure 8 (ii)

c) For each circuit in **Figure 9**, determine the total capacitance, C_{TOTAL}.

(14 marks)

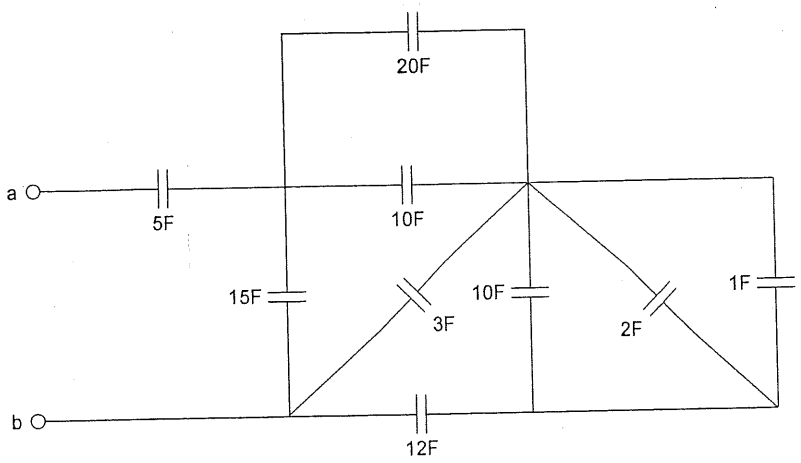

Figure 9 (i)

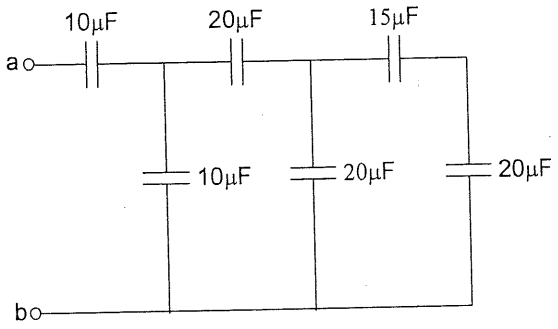

Figure 9 (ii)

d) Explain how to test a diode using a multimeter. (4 marks)

QUESTION 4

a) List **three (3)** types of material based on the electrical conductivity. (3 marks)

b) Draw a pnp Bipolar Junction Transistor (BJT) with the label. (2 marks)

c) Unlike the resistor where the relationship of current is linear with voltage, the transistor is a nonlinear device. List **three (3)** mode of operation for transistor. (3 marks)

d) Determine β_{DC} for a Bipolar junction transistor (BJT) circuit with I_C =6mA and I_B =60μA. (2 marks)

e) Differentiate single phase and three phase system. Support your answer with an illustration. (4 marks)

f) A wye-connected three-phase alternator supplies power to a delta-connected resistive load in **Figure 10** below. The alternator has a line voltage of 208 V. Each resistor of the delta load has 10 Ω of resistance. Analyze:

i. Line voltage of the load, $E_{L(Load)}$ (1 mark)
ii. Phase voltage of the load, $E_{P(Load)}$ (2 marks)
iii. Phase current of the load, $I_{P(Load)}$ (3 marks)
iv. Line current to the load, IL(Load) (3 marks)
v. Line current delivered by the alternator, $I_{L(Alt)}$ (2 marks)

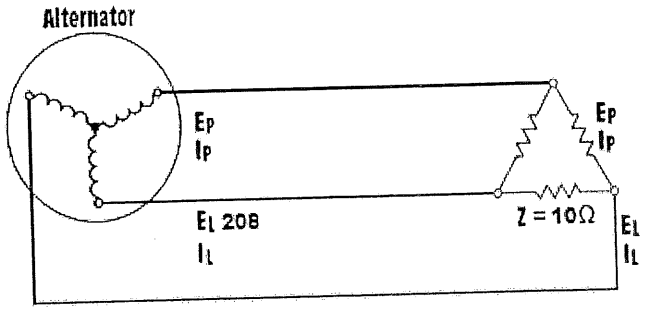

Figure 10

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

APPENDIX 1

1.	Current	$I = \frac{Q}{t}$
2.	Voltage	$V = \frac{W\ (joules)}{Q\ (coulombs)}$
3.	Ohm's Law	$V = IR$
4.	Series Capacitor	$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + ... + \frac{1}{C_N}$
5.	Parallel capacitor	$C_{eq} = C_1 + C_2 + ... + C_N$
6.	Series Inductor	$L_{eq} = L_1 + L_2 + ... + L_N$
7.	Parallel Inductor	$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2} + ... + \frac{1}{L_N}$
8.	Wye Connection	$I_{Line} = I_{Phase}$ $E_{Line} = E_{Phase}\ x\ 1.732$
9.	Delta Connection	$I_{Line} = I_{Phase}\ x\ 1.732$ $E_{Line} = E_{Phase}$