CONFIDENTIAL

UNIVERSITY COLLEGE TATI

# UNIVERSITY COLLEGE TATI (UC TATI)

## FINAL EXAMINATION QUESTION BOOKLET

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| COURSE CODE | : DEE 1113 |
| COURSE | : ELECTRICAL TECHNOLOGY I |
| SEMESTER/SESSION | : 1-2024/2025 |
| DURATION | : 3 HOURS |

Instructions:

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

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

**THIS BOOKLET CONTAINS 10 PRINTED PAGES INCLUDING COVER PAGE**

## QUESTION 1

a) Current consists of two types which are direct current (DC) and alternating current (AC). Draw both current waveform types. (4 marks)

b) Express each of the following numbers in **scientific notation**.

(i) 0.0046 (2 marks)

(ii) 780000000 + 680000 (3 marks)

c) Express each of the following numbers in **engineering notation** and **SI prefix** form.

(i) 13 000000 (4 marks)

(ii) 0.00000149 (4 marks)

d) Compute the **coulombs of charge** do $40 \times 10^{30}$ electrons possess. (4 marks)

## QUESTION 2

a) Draw symbol of resistor. (1 mark)

b) State THREE (3) factors determined the resistance of any material. (3 marks)

c) Figure 1 shows a 4 band resistor.

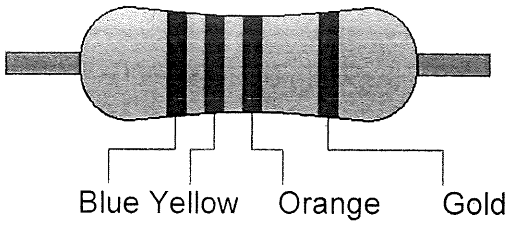


**Figure 1**

i) Determine the resistance values and tolerance for the following 4-band resistor. (2 marks)

ii) Find the minimum and the maximum resistance within the tolerance limits for the resistor in c) (i). (5 marks)

d) Determine the color bands for the 4 band resistor in Figure 2. Assume it has a 10% tolerance. (2 marks)

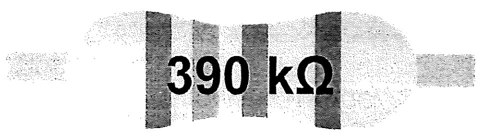


**Figure 2**

e) Express the resistance value in ohm (Ω) indicated in Figure 3. (1 mark)


**Figure 3**

f) Compute the **current, I** in the circuit in Figure 4. (3 marks)

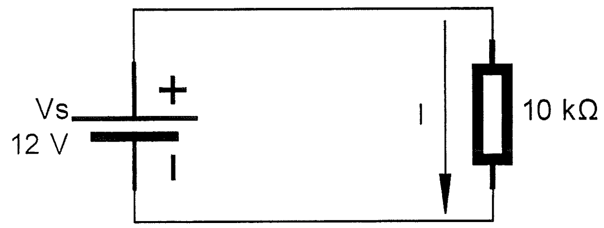


**Figure 4**

g) An electric heater works by passing a current of 100 A though a coiled metal wire, making it red hot. If the resistance of the wire is 2.4 Ω, determine **voltage** must be applied to it.

(3 marks)

h) Determine the **power** value does the resistor, R in Figure 5 dissipate. (3 marks)

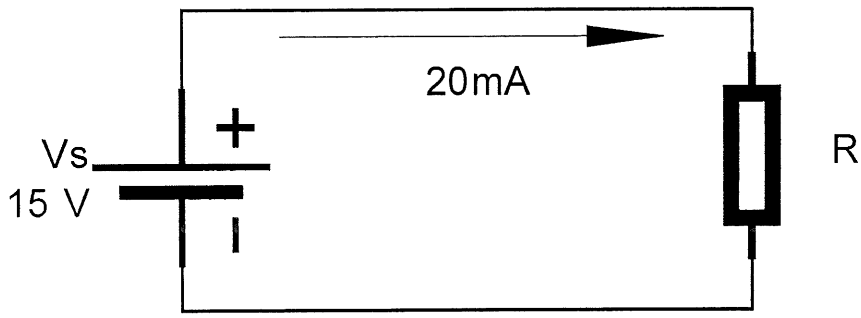


**Figure 5**

## QUESTION 3

a) For the circuit in Figure 6, calculate:

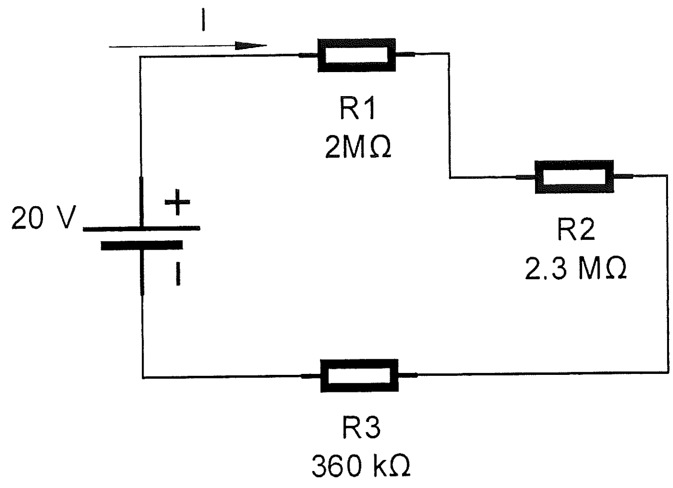


**Figure 6**

(i) Total resistance of the circuit. (3 marks)

(ii) Current, I flow in the circuit. (3 marks)

(iii) Voltage across R2. (3 marks)

b) Determine voltage drop at V4 in Figure 7 using Kirchhoff's Voltage Law. (2 marks)

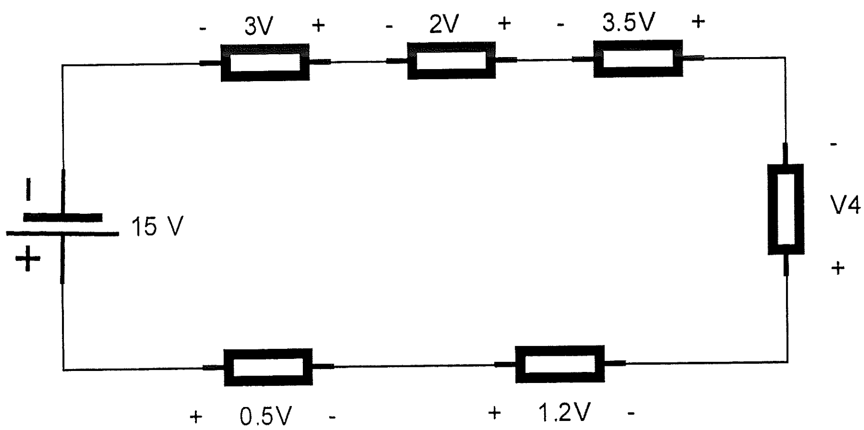


**Figure 7**

c) For the voltage divider circuit shown in Figure 8;

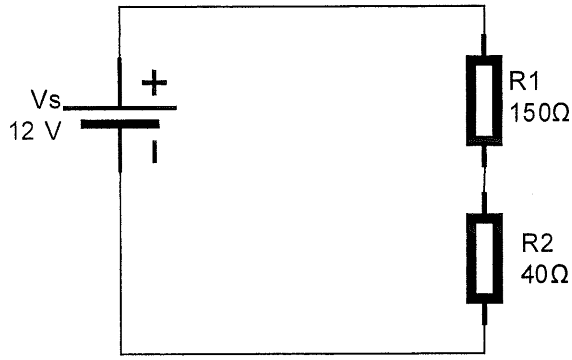


**Figure 8**

(i) Express the voltage across R2 using voltage divider formula. (4 marks)

(ii) Calculate the total power in the circuit. (4 marks)

d) For the circuit in Figure 9;

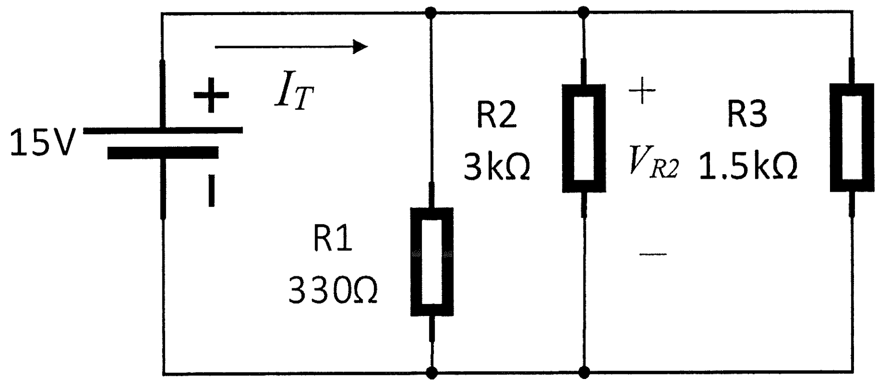


**Figure 9**

(i) Compute total resistance, $R_T$ of the circuit. (3 marks)

(ii) Determine total current, $I_T$. (3 marks)

(iii) Express voltage at $R_2$, $V_{R2}$. (2 marks)

**QUESTION 4**

a) Find the capacitance when Q = 50 μC and V = 10 V. (3 marks)

b) For the circuit in Figure 10;

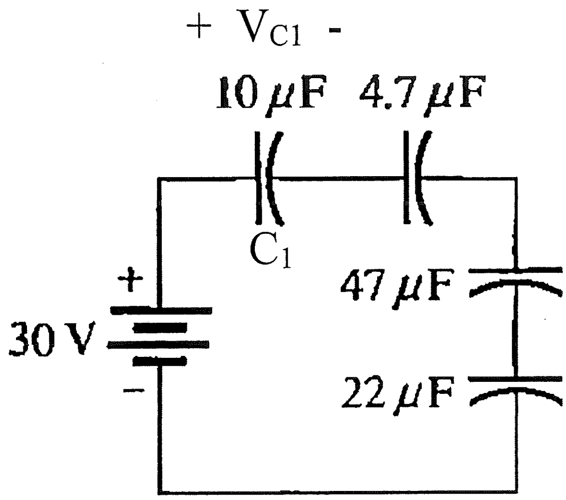


**Figure 10**

(i) Compute the total capacitance for the circuit, $C_T$. (3 marks)

(ii) Calculate the voltage across $C_1$, $V_{C1}$. (3 marks)

c) Figure 11 shows a parallel connection of capacitors.

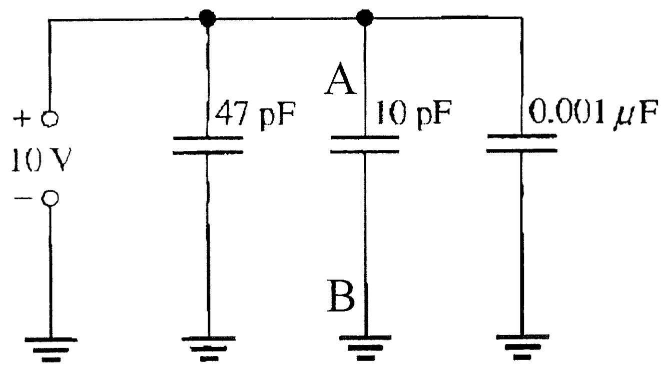


**Figure 11**

(i) Calculate the total capacitance for the circuit, $C_T$. (3 marks)

(ii) Determine the voltage across point A and B. (2 marks)

d) Find the amount of energy stored in a 4.7 mH inductor when the current is 2 A.

(3 marks)

e) A student wraps 100 turns of wire on a pencil that is 0.007m in a diameter as shown in Figure 12. The pencil has the same permeability as a vacuum ($4\pi \times 10^{-6}$ H/m). Find the **inductance**, L of the coil that is formed. (3 marks)

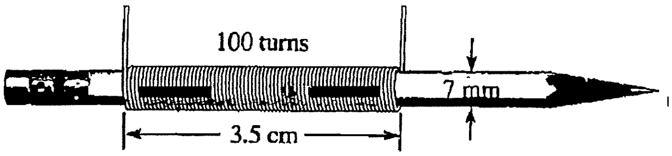


**Figure 12**

f) Compute the **total inductance,** $L_T$ for Figure 13 and Figure 14.

(i) (2 marks)

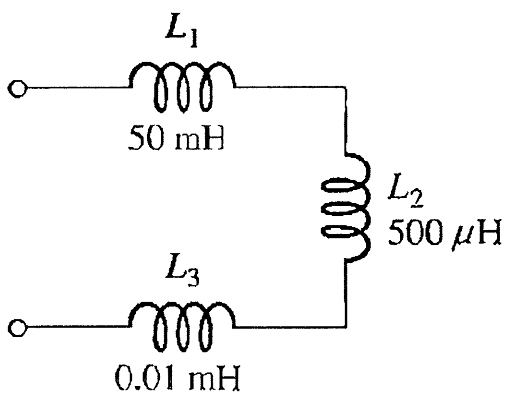


**Figure 13**

(ii) (4 marks)

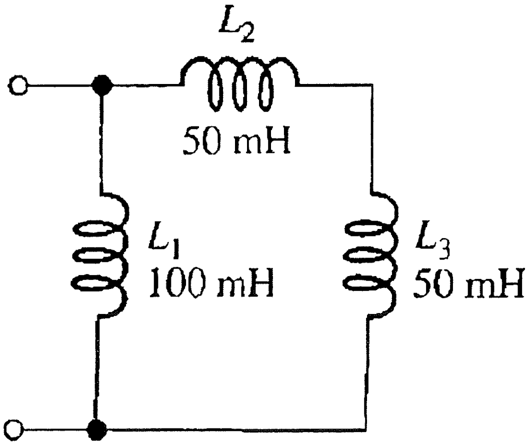


**Figure 14**

g) Determine the time constant, τ for the series of RL combinations as in the Figure 15.

(3 marks)

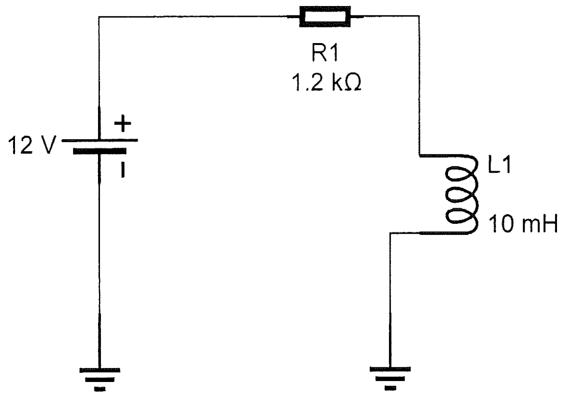


**Figure 15**

---------------------------------------------**End of question**------------------------------------------

## Appendix

| | |
|---|---|
| $Q = \dfrac{number \;\; of \;\; electron}{6.25 \times 10^{18} \; e / C}$ | |
| $I = \dfrac{Q}{t}$ | |
| $P = V \times I$ $\quad$ $P = V^2 \div R$ <br> $P = I^2 \times R$ | |
| $V = W \div Q$ | |
| $R = \rho \, l/A \; \Omega$ | |
| $V = IR$ | |
| $L = \dfrac{N^2 \mu A}{l}$ | |
| $W = \frac{1}{2} LI^2$ | |
| $\tau = L/R$ | |

| Color | Value | Multiplier | Tolerance |
|---|---|---|---|
| Black | 0 | $x10^0$ | ±20% |
| Brown | 1 | $x10^1$ | ±1% |
| Red | 2 | $x10^2$ | ±2% |
| Orange | 3 | $x10^3$ | ±3% |
| Yellow | 4 | $x10^4$ | -0,+100% |
| Green | 5 | $x10^5$ | ±0.5% |
| Blue | 6 | $x10^6$ | ±0.25% |
| Violet | 7 | $x10^7$ | ±0.10% |
| Gray | 8 | $x10^8$ | ±0.05% |
| White | 9 | $x10^9$ | ±10% |
| Gold | 5% | $x10^{-1}$ | ±5% |
| Silver | 10% | $x10^{-2}$ | ±10% |