UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL & BIOENGINEERING TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE	:	CCB 21102
COURSE NAME	:	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING
PROGRAMME NAME	:	BACHELOR
DATE	:	28 JANUARY 2026
TIME	:	2.00 PM – 4.00 PM
DURATION	:	2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of FIVE questions.
4. Answer FOUR questions only.
5. Please write your answer in the answer booklet provided.
6. Please answer all questions in English only.
7. Refer to the attached Formula/Appendix.

THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR questions only.

Question 1

(a) List three differences between active and passive components.

(6 marks)

(b) Explain two basic functions of a vacuum tube.

(4 marks)

(c) Describe three common classifications of electronic systems.

(6 marks)

(d) Describe three changes that can be made to the magnetic field environment to induce voltage.

(6 marks)

(e) List three factors that contribute to the strength of the magnetic field.

(3 marks)

Question 2

(a) Explain three differences between a fuse and a circuit breaker.

(6 marks)

(b) Explain three basic rules of electricity.

(6 marks)

(c) Describe three practices that should be followed by laboratory workers that may reduce the risk of injury or fire when working with electrical equipment.

(6 marks)

(d) An overloaded circuit is a significant source of potential house fires. Explain two possible causes due to which overloading may occur.

(4 marks)

(f) List three components in a circuit breaker.

(3 marks)

Question 3

(a) In a three-phase delta connection system, the line voltage is 415 V. The non-inductive loads of 50 W, 150 W, and 200 W are connected between the three-line conductors as shown in Figure 1. Calculate:

i. The phase voltage, V_{P1}.

(2 marks)

ii. The line current, I_{L2}.

(4 marks)

iii. The load resistance, R_3.

(4 marks)

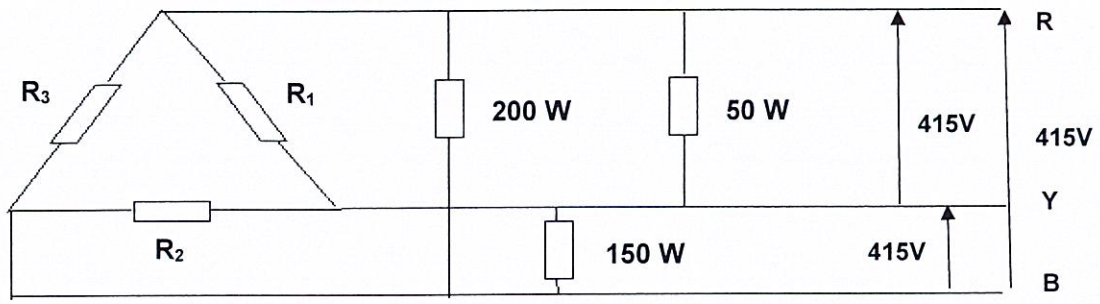


Figure 1 Delta Connection

(b) Calculate the value of current flow, I at R_3 as shown in Figure 2.

(15 marks)

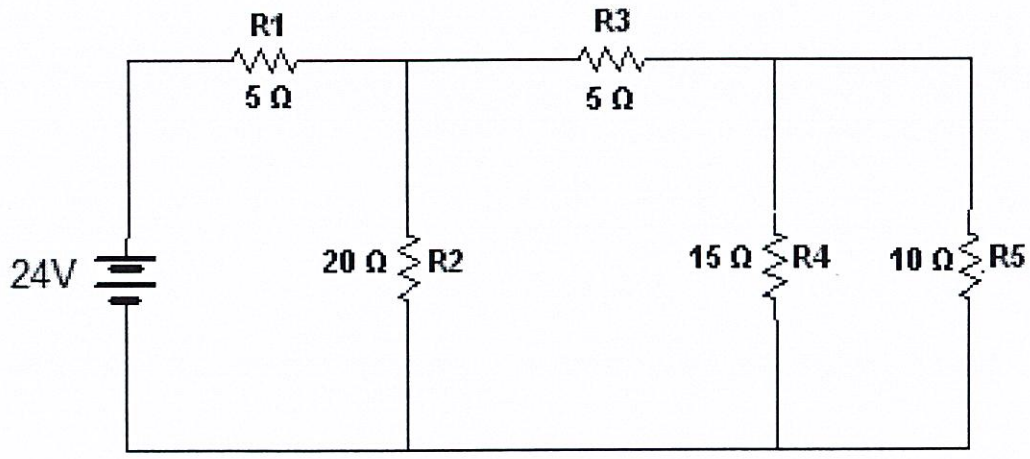


Figure 2 DC Circuit

Question 4

(a) A flux of 0.5mWb is produced in a coil of 900 turns wound on a wooden ring by a current of 3A. Calculate:

i. The inductance of the coil, L.

(3 marks)

ii. The average e.m.f, V_{emf} induced in the coil when a current of 3A is switched off, assuming the current to fall to zero in 1 ms.

(4 marks)

iii. The mutual inductance, M between the coils, if a second coil of 600 turns with 80% efficiency was wound over the first coil.

(6 marks)

(b) A large electromagnet is wounded with 1000 turns. A current of 2 A in this winding produces a flux, Φ through the coil of 0.03 Wb.

i. Calculate the inductance, L of the electromagnet.

(3 marks)

ii. If the current in the coil is reduced from 2 A to zero in 0.1s, calculate the induced voltage, V_{emf} in the coil.

(4 marks)

(c) Figure 3 shows the direction of current flow through a solenoid.

i. Identify the polarity (N and S) of the solenoid.

(2 marks)

ii. Sketch the direction of magnetic field for the solenoid.

(3 marks)

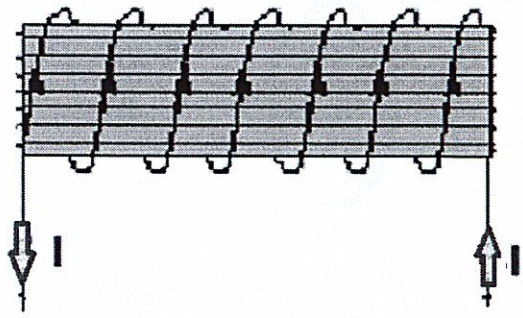


Figure 3 Solenoid

Question 5

(a) The circuit shown in Figure 4 has been connected to single phase power supply. The input voltage, V_S are adjusted to 120 V_{ac}, with frequency, f = 50 Hz. Calculate the total current, I_S.

(14 marks)

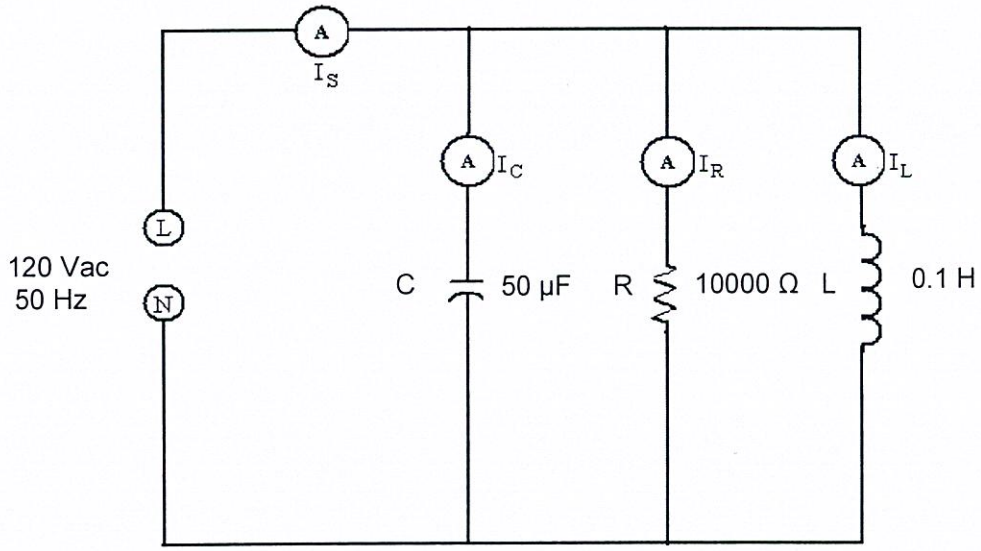


Figure 4 RLC Circuit in Parallel

(b) Two circular flat coils are co-axial as shown in Figure 5. The smaller (secondary) coil has 25 turns and is 20 mm in diameter. The larger (primary) coil has 200 turns and 40 mm diameter. Calculate the mutual inductance, M of the two coils, assuming the magnetic field of the primary coil is uniform through the secondary coil.

(5 marks)

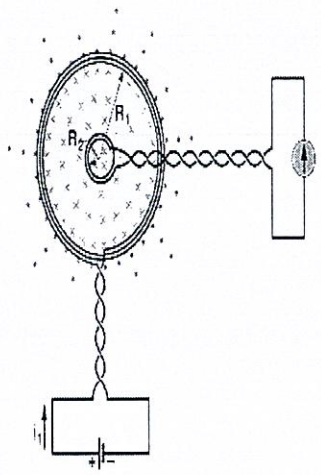
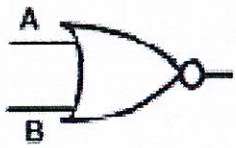


Figure 5 Circular Flat Coils

(c) Indicate the input and output of the Truth Table for the logic gate below.

(6 marks)

Table 1

Input A	Input B	Output	
			

END OF EXAMINATION PAPER

FORMULAE

1. $L = \mu_o N^2 \frac{A}{l}$, self-inductance
   $\mu_O = 4\pi \times 10^{-7}$

2. $L = \frac{N\Phi}{I}$, self-inductance

3. $M = \frac{\pi \mu_o N_S N_P r_S^2}{2r_P}$, mutual inductance

4. $M = k\sqrt{L_P L_S}$, mutual inductance

5. $V_{emf} = -L\frac{di}{dt}$, induced voltage

6. $\Phi = BA$ flux

7. $B = \mu_o \frac{I}{2\pi r}$ for current flow

8. $B = \mu_o \frac{I}{2r}$ for short coil

9. $B = \mu_o \frac{NI}{l}$ for long coil

10. $H = \frac{NI}{l}$ field intensity

11. $S = \frac{NI}{\Phi}$, reluctance

12. $V_X = \frac{R_X}{R_{eq}}(V_T)$, voltage divider

13. $I_x = \frac{R_{eq}}{R_x}(I_{source})$, current divider

14. $Z = \sqrt{R^2 + (X_L - X_C)^2}$, total impedance

15. $I_T = \sqrt{I_R^2 + (I_C - I_L)^2}$, total current

16. $X_L = 2\pi fL$, inductive reactance

17. $X_C = \frac{1}{2\pi fC}$, capacitive reactance

18. $I_L = I_P$, star connection
    $V_L = 1.73V_P$

19. $V_L = V_P$, delta connection
    $I_L = 1.73I_P$