UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DEE1123
COURSE	: ELECTRICAL TECHNOLOGY II
SEMESTER (SESSION)	: 2 – 2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions. Answer **ALL** .
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hand 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) Name **TWO (2)** sources of generation alternating current, AC voltage supply. (2 marks)

b) Answer the following questions:

i. Briefly define peak to peak voltage, V_{pp} and peak voltage, V_p of a sine wave voltage. (4 marks)

ii. Illustrate the sine wave value in b)i in a sine wave diagram and label all the value. (3 marks)

c) The values in Figure 1 are given in rms. Compute:

i. Total rms current, I_{total}. (3 marks)

ii. Total power if Vs = 20V. (3 marks)

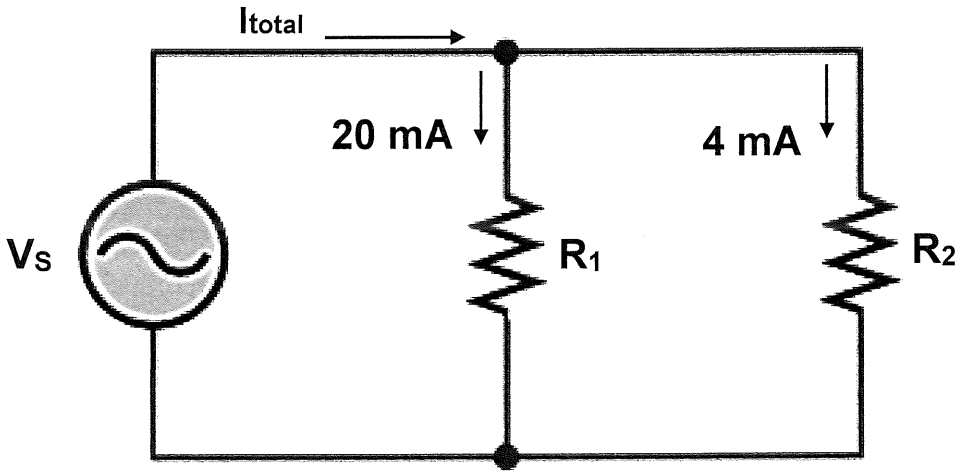

Figure 1

d) For the sine wave in Figure 2, calculate the;

i. Period time, **T.** (3 marks)

ii. Frequency, f. (3 marks)

iii. Peak Voltage, **Vp.** (3 marks)

iv. RMS voltage, **Vrms** . (3 marks)

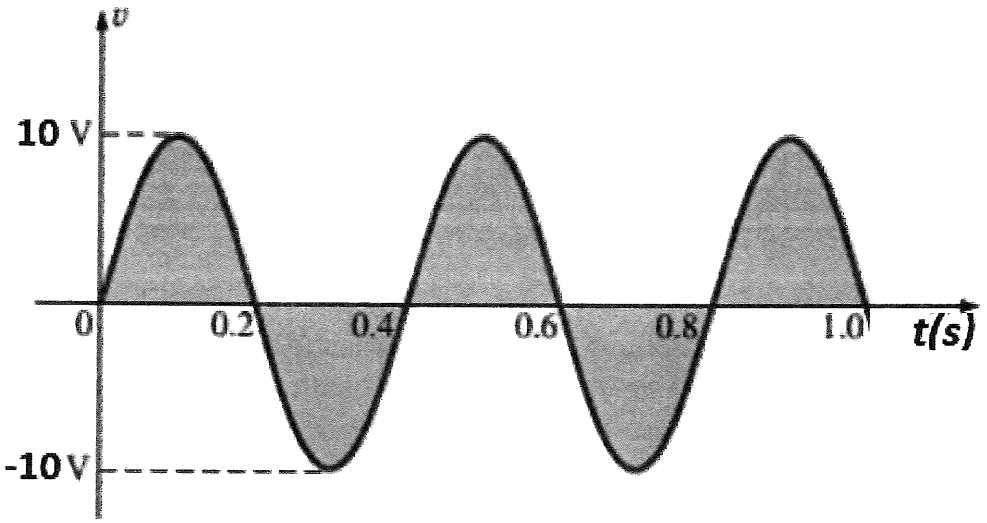

Figure 2

e) Figure 3 shows a sine wave B is shifted left in relation to the reference sine wave. Answer the following questions:

i. Express the shifted sine wave equation for sine wave B. (2 marks)

ii. Using the sine wave equation in e) i, compute the instantaneous voltage at the 105° for sine wave B. (3 marks)

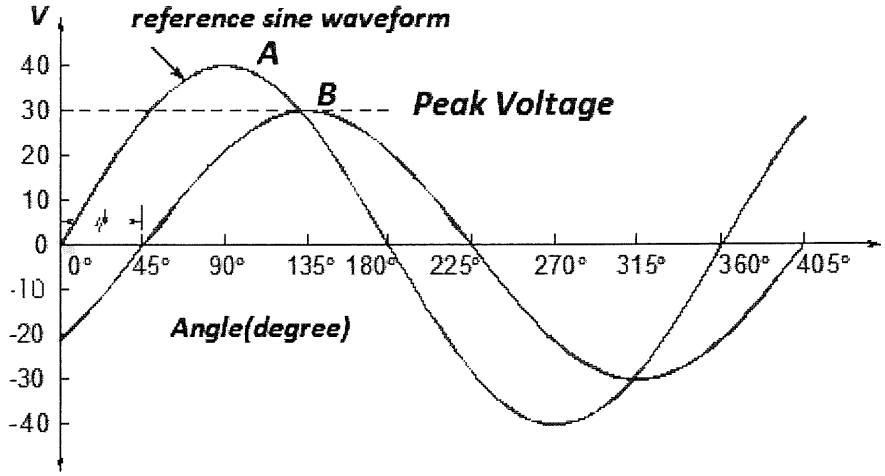

Figure 3

f) For function generator which is always you use in the Industry Electronic laboratory:

i. List **two (2)** types of waveform on function generator (2 marks)

ii. Select **two (2)** main buttons and explain its function. (2 marks)

QUESTION 2

a) The bar magnets with poles marked north (N) and south (S) is shown in Figure 4. Draw the magnetic flux direction of the magnet: (2 marks)

Figure 4

b) Refer to the magnetic circuit in Figure 5 and together with the data provided, calculate the following parameters:

i. The flux density, ***B.*** (3 marks)

ii. The magnetomotive force, ***Fm.*** (3 marks)

iii. The Magnetic field intensity, ***H.*** (3 marks)

iv. The reluctance, $\mathcal{R}$ of the material (3 marks)

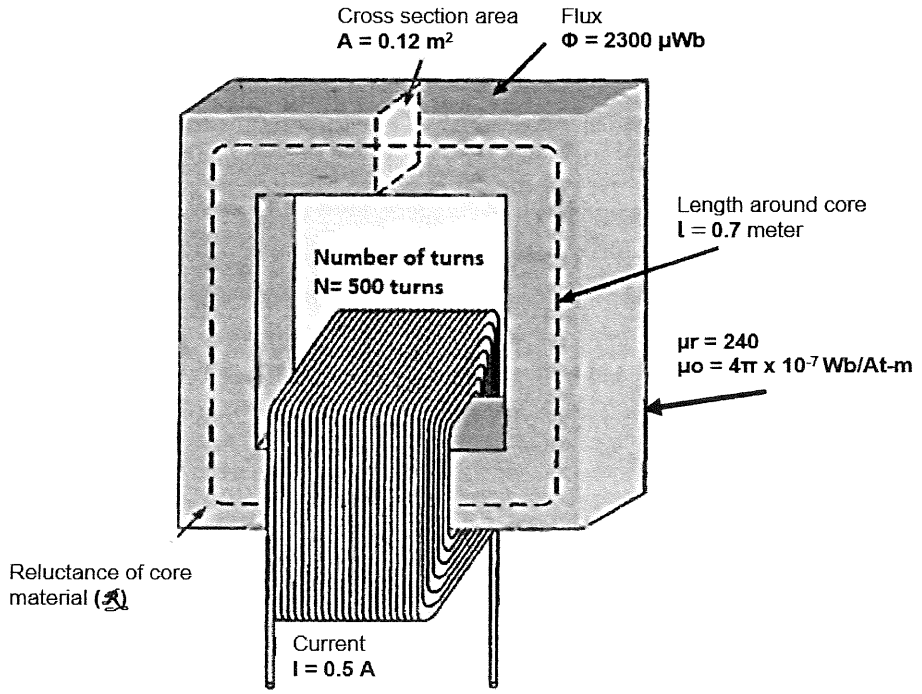

Figure 5

QUESTION 3

a) Figure 6 shows the mutual inductance of two coils. Based on the stated data in the circuit, calculate:

i. Coefficient of coupling, **k** of the transformer. (3 marks)

ii. Mutual inductance, L_M of this transformer. (3 marks)

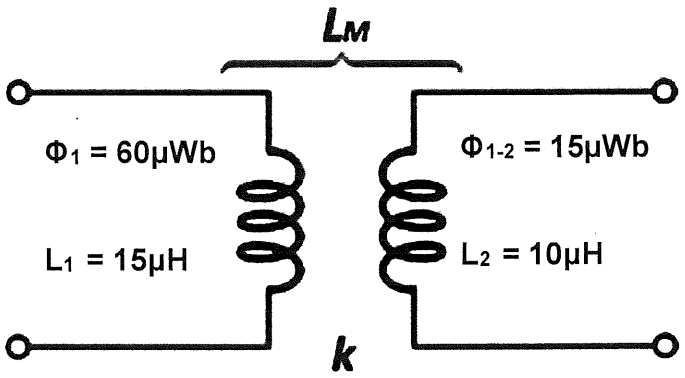

Figure 6

b) Answer the following questions:

i. Name **THREE (3)** types basic transformer core. (3 marks)

ii. Draw the schematic symbol to indicate the answer from b)i. (6 marks)

c) For the transformer in Figure 7;

i. State the type of transformer. (1 mark)

ii. Compute the turn ratio, **n.** (2 marks)

iii. Find the secondary voltage, $V_{(sec)}$. (3 marks)

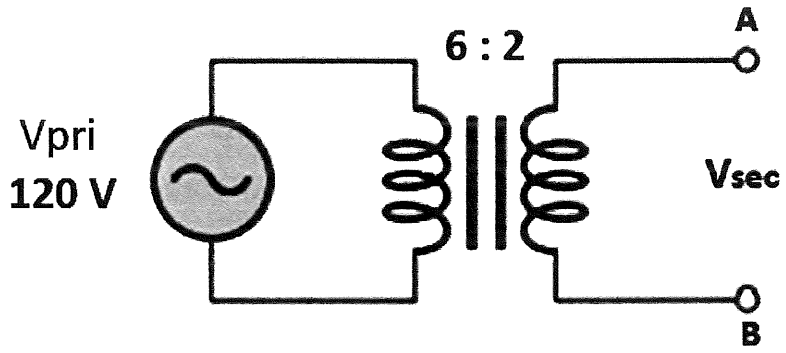

Figure 7

d) Transformer in Figure 8 has loaded secondary winding. The primary current (I_{pri}) is 120 mA in Figure 8 calculate:

i. The load current on secondary winding, I_{sec}. (3 marks)

ii. The voltage value of R_L. (3 marks)

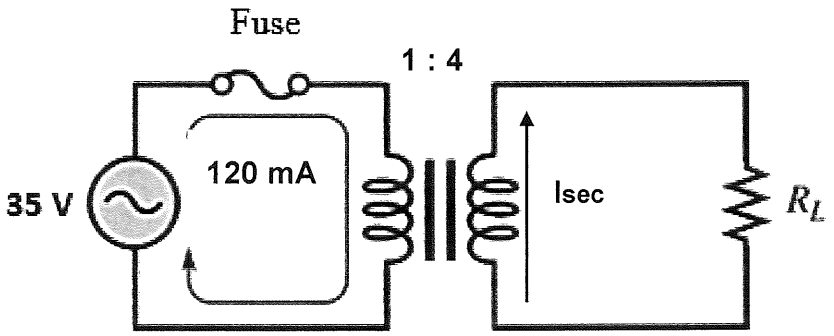

Figure 8

e) A non-ideal transformer experience losses. Give **ONE (1)** loss mechanisms of the non-ideal transformer. (1 mark)

f) Refer to the Figure 9 of the non ideal transformer, determine:

i. The primary power, ***Ppri.*** (3 marks)

ii. The secondary power, ***Psec***. (3 marks)

iii. The efficiency, η of the transformer. (2 marks)

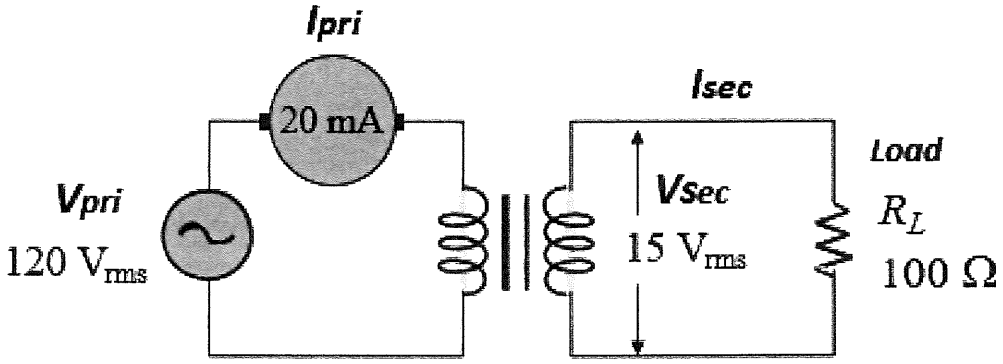

Figure 9

QUESTION 4

a) Name **TWO (2)** basic forms of the connection of three phase system.

(2 marks)

b) A star-connected three-phase alternator supplies power to a delta-connected resistive load as stated in Figure 10. The alternator has a line voltage of 480 V. Determine the following values:

i. Phase voltage of the alternator, $V_{PHASE(Alt)}$ (3 marks)

ii. Line current of the alternator, $I_{LINE(Alt)}$ (3 marks)

iii. Phase current of the load, $I_{PHASE(Load)}$ (3 marks)

iv. Line current of the load, $I_{LINE(Load)}$ (3 marks)

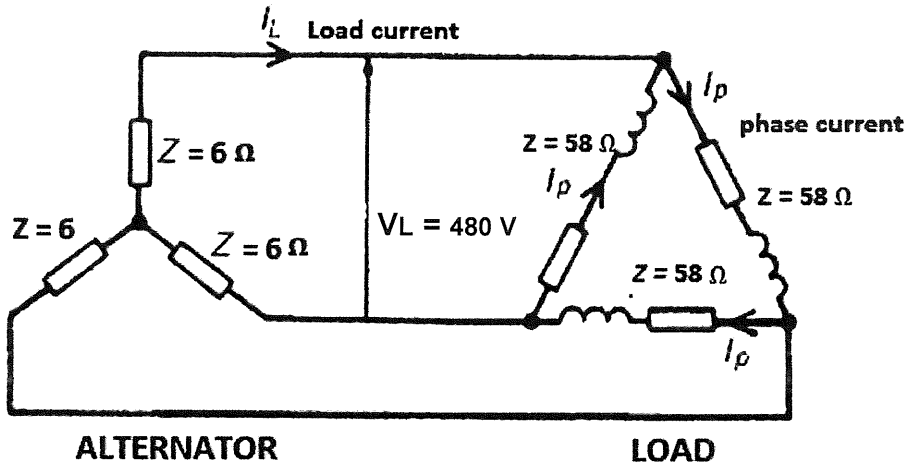

Figure 10

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

APPENDIX

1. $V_{rms} = 0.707V_p$
2. $V_{avg} = = 0.637V_p$
3. $v = V_p \sin \theta$
4. $v = V_p \sin (\theta \pm \emptyset)$
5. $V_{rms} = 0.707V_p$
6. $V_{avg} = = 0.637V_p$
7. $v = V_p \sin \theta$
8. $v = V_p \sin (\theta \pm \emptyset)$
9. $v = V_p \sin 2\pi ft$
10. $V_{rms} = 0.707V_p$
11. $V_{avg} = = 0.637V_p$
12. $v = V_p \sin \theta$
13. $v = V_p \sin (\theta \pm \emptyset)$
14. $v = V_p \sin 2\pi ft$
15. $B = \frac{\emptyset}{A}$
16. $\mu_r = \frac{\mu}{\mu_0}$
17. $\mathcal{R} = \frac{l}{\mu A}$
18. $F_m = NI$
19. $\varphi = \frac{F_m}{\mathcal{R}}$
20. $L_M = k\sqrt{(L_1 L_2)}$
21. $k = \frac{\emptyset_{1-2}}{\emptyset_1}$
22. $A = \pi r^2$
23. $\eta = \left(\frac{P_{out}}{P_{in}}\right) 100\%$
24. $\frac{Vpri}{Vsec} = \frac{Npri}{Nsec} = \frac{Isec}{Ipri}$
25. Delta

    $I_\phi = \frac{I_L}{1.732}$
26. $i = \frac{v}{z}$
27. Y_connected

    $V_\phi = \frac{V_L}{1.732}$