



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in Electrical Engineering

EEP2105: CIRCUIT THEORY II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

DATE: APRIL 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** Questions; Attempt **QUESTION ONE** and any other **TWO** Questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

1. (a) Briefly explain any **TWO** advantages of generating alternating currents as opposed to direct currents. (4 marks)
- (b) With aid of a diagram, explain the principle of operation of an a.c generator.(9 marks)
- (c) (i) Explain the term series resonance
- (ii) Show that the resonance frequency f_r is given by;

$$f_r = \frac{1}{2\pi\sqrt{LC}} \text{ Hz}$$

Where; L= inductance

C=capacitance. (7 marks)

2. (a) by aid of well labelled diagrams, differentiate between unidirectional and alternating waveforms. (4 marks)

(b) Explain the following terms as used in A.C theory.

- i. Amplitude
- ii. Peak-to-peak value
- iii. Instantaneous values.
- iv. Effective value (8 marks)

(c) An alternating current is given by; $I = 65 \sin(250\pi t - 0.25)$ Amperes.

Determine the ;

- i. peak-to-peak value
- ii. periodic time
- iii. r.m.s value
- iv. phase angle in degrees. (8 marks)

3. (a) A coil of resistance 8Ω and inductance 110 mH in series with a $120\mu\text{F}$ capacitor is connected to a 240V, 50 Hz supply. Calculate the;

- i. inductive reactance
- ii. capacitive reactance
- iii. circuit impedance
- iv. current flowing
- v. phase difference between the supply voltage and current,
- vi. voltage across the capacitor. (10 marks)

(c) (i) State any three essential devices that an analogue electrical indicating instruments require.

(ii) Highlight three advantages of electronic measuring instruments over analogue indicating measuring instruments. (6 marks)

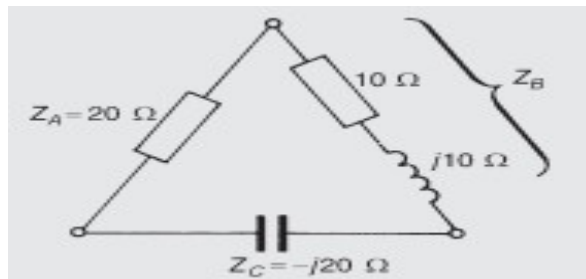
(ii) A moving-coil instrument gives an f.s.d. when the current is 50 mA and its resistance is 25Ω . Calculate the value of the shunt to be connected in parallel with the meter to enable it to be used as an ammeter for measuring currents up to 50 A. (4 marks)

4. (a) With aid of a well labelled diagram, explain the principle of operation of a transformer. (7 marks)

- (b) A 30 kVA, single-phase transformer has a turns ratio of 10:2 and is supplied from a 2.5 kV supply. Neglecting losses, determine;
- the full load secondary current
 - the minimum value of load resistance which can be connected across the secondary winding without the kVA rating being exceeded.
 - the primary current. (6 marks)
- (c) Using a well labelled diagram, briefly describe how No-load test is carried out in transformers. (7 marks)

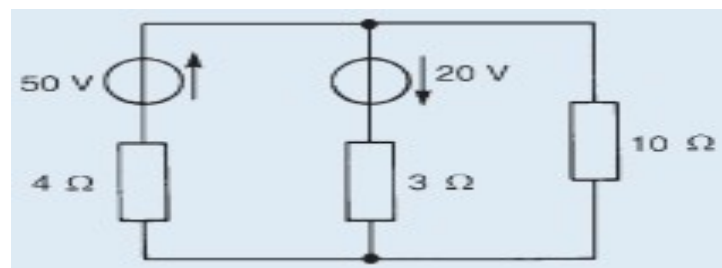
5. (a) Replace the delta-connected network shown in figure I by an equivalent star connection.

Fig. I
(10 marks)



- (b) Use Thévenin's theorem to determine the current flowing in the 10 Ω resistor of the d.c. network shown in the figure II below.

Fig. II



(10 marks)

