ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION 2022/2023 ACADEMIC SESSION

COURSE TITLE: FUNDAMENTALS OF ELECTRICAL ENGINEERING/BASIC ELECTRICAL ENGINEERING I

COURSE CODE: GNE 257/GNE 223

EXAMINATION DATE: 5TH APRIL, 2023

COURSE LECTURER: ENGR. OSHIN OLA A

HOD'S SIGNATURE

TIME ALLOWED: 2 HOURS

INSTRUCTIONS:

1. ANSWER ANY FOUR QUESTIONS ONLY
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.
3. YOU ARE **NOT** ALLOWED TO BORROW ANY WRITING MATERIAL DURING THE EXAMINATION.

Question 1

a. Differentiate between the following pairs of elements: Linear, Non-linear, passive and active elements (4 marks)

b. **Determine the current in the** 8- Ω resistor using nodal analysis or superposition theorem in the circuit shown in Fig.Q1b (8 marks)

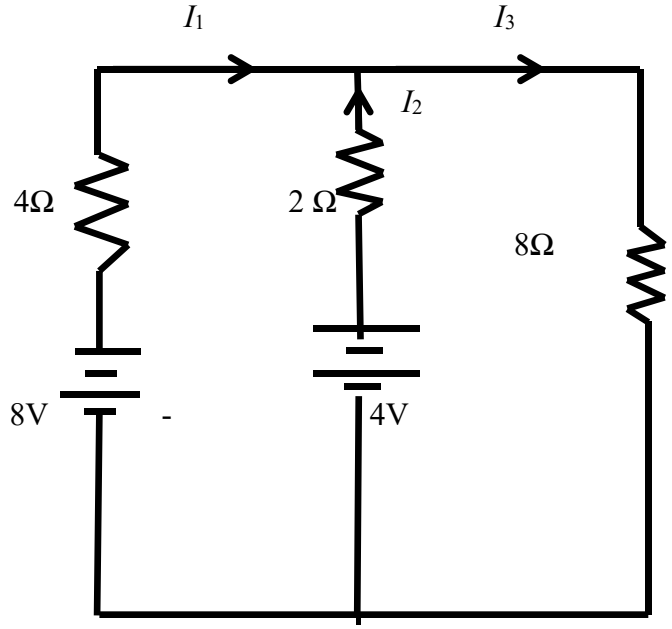


Fig. QIb

c ii. Convert the network circuit in Frg.Q1c to an equivalent Thevenin's circuit

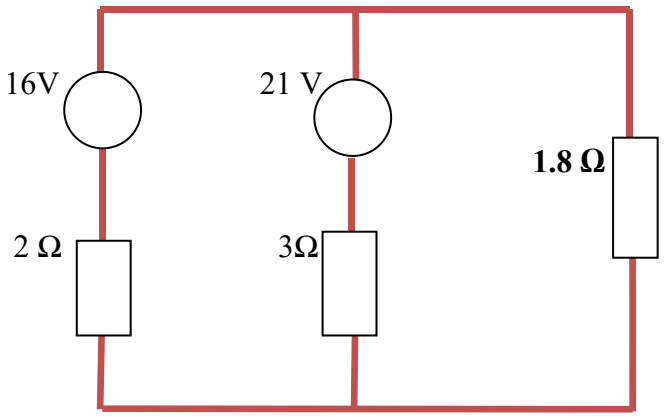


Fig. Qic

ii) Determine the current flowing in the **1.8 Ω** resistor using Thevenin's theorem or Kirchhoff's theorem (8 marks)

Question 2

a. i. Briefly describe the following terms:

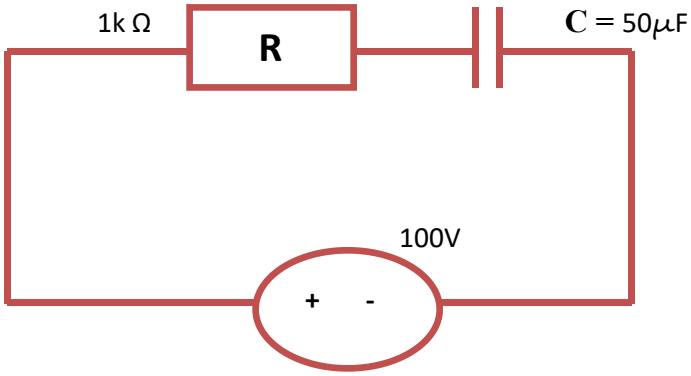
(i) Transient and

(ii) Time constant for a C-R circuit (4 marks)

ii. Describe the transient response of capacitor and resistor voltages and current in a series R-C d.c Circuit (4 marks)

iii. Illustrate the transient growth and decay for the C-R Circuit in Q2a ii (2 marks)

b. The circuit shown in figure Q2b is a 50μF uncharged capacitor connected in series to a 1k Ω resistor and the circuit is switched to a 100V, d.c. supply.



Determine:

i. the initial current flowing in the circuit,
ii. the time constant
iii. the value of current when *t* is 50ms and
iv. the voltage across the resistor 60ms after closing the switch (10 marks)

Question 3

a.

(i) Describe the operation principle of a full wave rectification (4 marks)
(ii) Explain the process of removing unwanted ripples from the output of a rectifier (2 marks)
(iii) State and explain four (4) important parameters to be considered when choosing a smoothing capacitor for use in a rectifier (4 marks)

b. i. Determine the current in the 8 Ω resistor using Norton's theoremin the circuit of Fig. Q3b

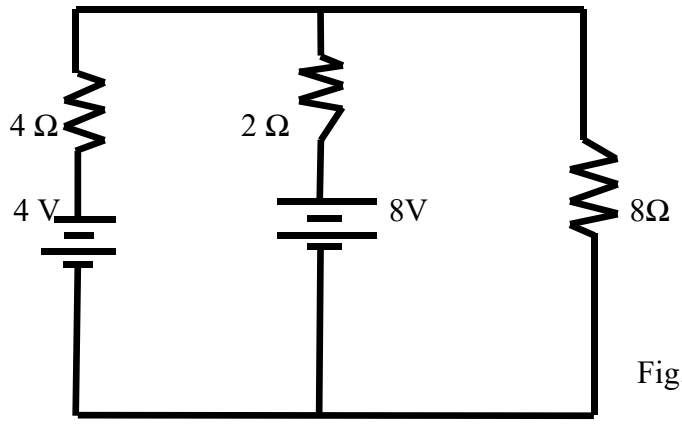


Fig. Q3b

(ii) Hence, determine the power dissipated in the 8 Ω resistor (12 marks)

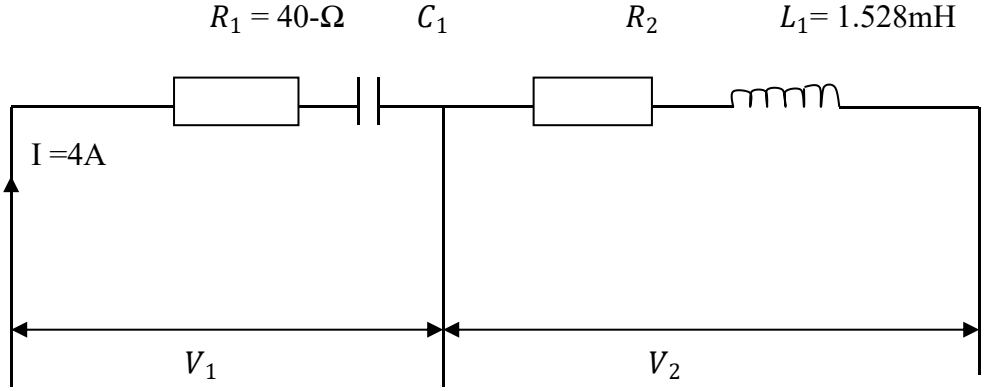
Question 4

a. With the aid of suitable waveform diagrams, describe what you understand by the following

i. Leading power factor in a purely capacitive circuit

ii. Lagging power factor in a purely inductive circuit (4 marks)

b. The instantaneous value of two alternating voltages shown in Fig. Q4b are represented by V_1= 236.174 sin (15710t – 12.68^0) , V_2= 147.078 sin (15710t +67.38^0)



The supply frequency is 2.5kHz and find a sinusoidal expression representing $V_1 + V_2$

i. Express V_1 in phasor form and in rectangular form

ii. Express V_2 in phasor form and in rectangular form

iii. Find a sinusoidal expression representing $V_1 + V_2$

iv. Draw the phasor diagram for the circuit (16 marks)

Question 5

a. Explain what you understand by the following terms in relation to PN type semiconductor diode :

i. reverse bias

ii. forward bias

iii. depletion layer

iv. contact potential (10 marks)

a. Corresponding readings of base current, I_B, and base-emitter voltage, V_{BE}, for a bipolar junction transistor are given in the table Q5b:

V_{BE} (V)	0	0.0	0.2	0.3	0.4	0.5	0.6	0.7	0.8
I_B(μ A)	0	0	0	0	1	3	19	57	130

Plot the I_B/V_{BE} characteristic for the device and use it to determine
(a) the value of I_B when V_{BE}=0.65V,
(b) the static value of input resistance when V_{BE}=0.65V, and
(c) the dynamic value of input resistance when V_{BE}=0.65V (10 marks)

Question 6

a. With reference to a n-p-n transistor, explain briefly what is meant by the term 'transistor action' and why a bipolar junction transistor is so named. (5 marks)

b. With the aid of a suitable diagram, explain how a transistor can be used as switch using a light dependent resistor (8 marks)

c. Determine the total admittance (Y), Conductance (G) and Inductive Susceptance (B_L) in rectangular and polar forms for the circuit in Fig. Q6c

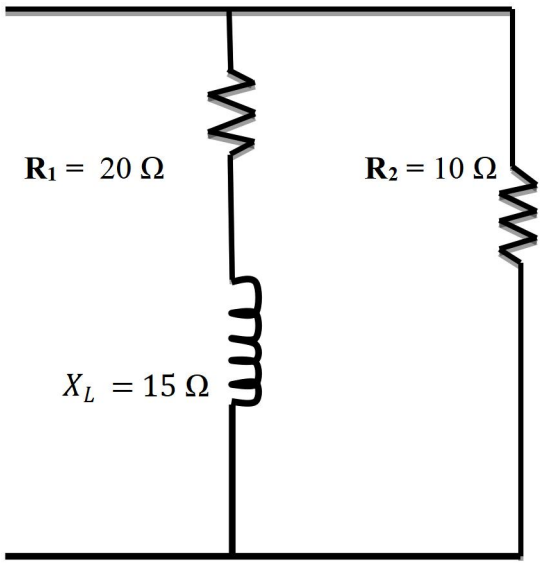


Fig. Q6c (7 marks)