ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION 2019/2020 ACADEMIC SESSION

COURSE TITLE: BASIC ELECTRICAL ENGINEERINGI

COURSE CODE: GNE 223

EXAMINATION DATE: 14TH FEBRUARY, 2020

COURSE LECTURER: ENGR. OSHIN OLA A

HOD'S SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

1. ANSWER ANY FIVE 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[20 marks]

a. Using suitable diagram, explain the operation of half wave rectification (5 marks)

b. Suppose the colour code on a resistor is red, yellow, blue, blue and silver. What is the resistance of the resistor? (2 marks)

c. Determine the loop equations when the close circuits are meshed with currents in the network shown in Fig. Q1c

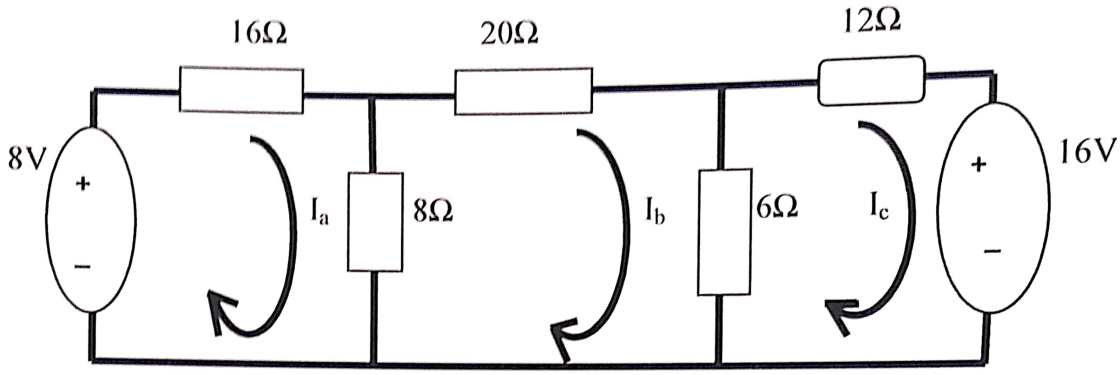

Fig. Q1c

ii. Determine the current and the power dissipated in each of the 8Ω, 20 Ω and 12 Ω resistors using Loop analysis (13 marks)

Question 2[20 marks]

a. Explain the difference between the following elements: (i) Linear, (ii) Non-linear, (iii) passive and (iv) active elements (4 marks)

b. Determine the current in the 8Ω resistor using nodal analysis or superposition Theorem for the circuit shown in Fig Q2b (8 marks)\

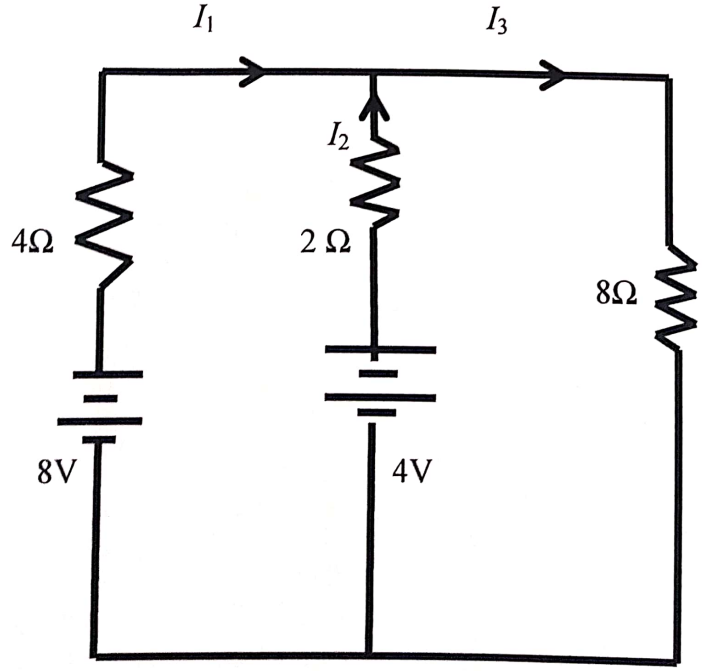

Fig Q2b

ci. Convert the network shown in Fig Q2c to an equivalent Thevenin's circuit[**3 *marks***]

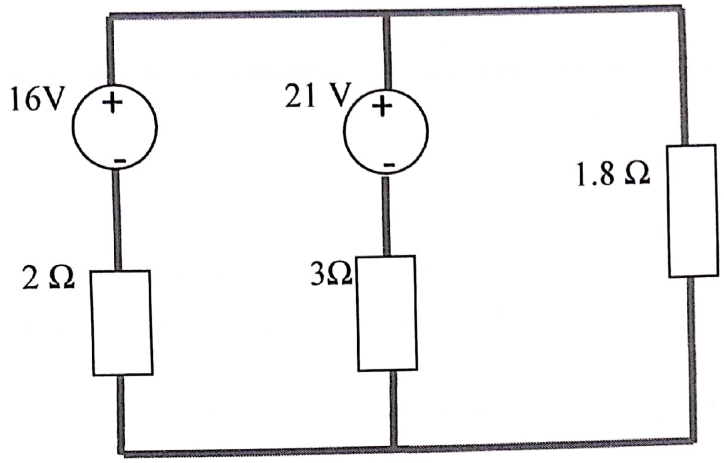

Fig Q2c

ii) Determine the current flowing in the **1.8 Ω** resistor using Thevenin's theorem or Kirchhoff's theorem(5 marks)

Question 3 [20 marks]

a. i. Explain the meaning of the following terms:[**4 *marks***]

(i) Transient and

(ii) Time constant for anRC circuit

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

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

b. The circuit shown in Fig Q3b is a 50μF uncharged capacitor connected in series with a 1k Ω resistor and the circuit is switched to a 100V, d.c. supply.

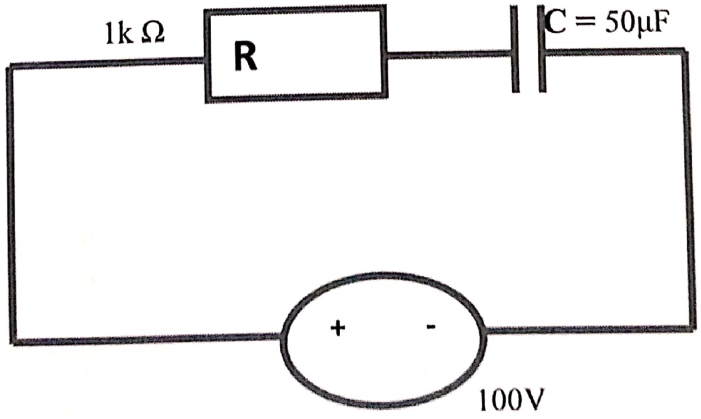

Fig Q3b

Determine the

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

Question 4[20 marks]

a. (i) Describe the operation and construction 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 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 in the c ircuit shown in Fig. Q4b using Norton's theorem

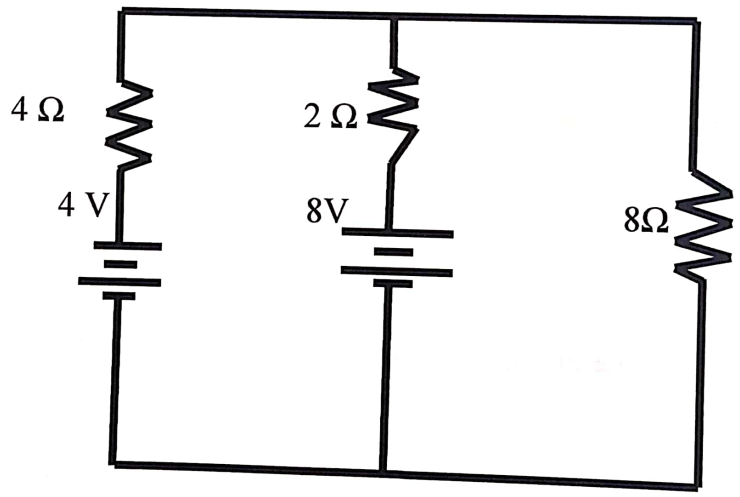

Fig. Q4b

(ii) Hence, determine the power dissipated in the 8 Ω resistor(10 marks)

Question 5[20 marks]

a. Using 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. Q5b are represented by $V_1 = 236.174 \sin(15710t - 12.68^0)$, $V_2 = 147.078 \sin(15710t + 67.38^0)$

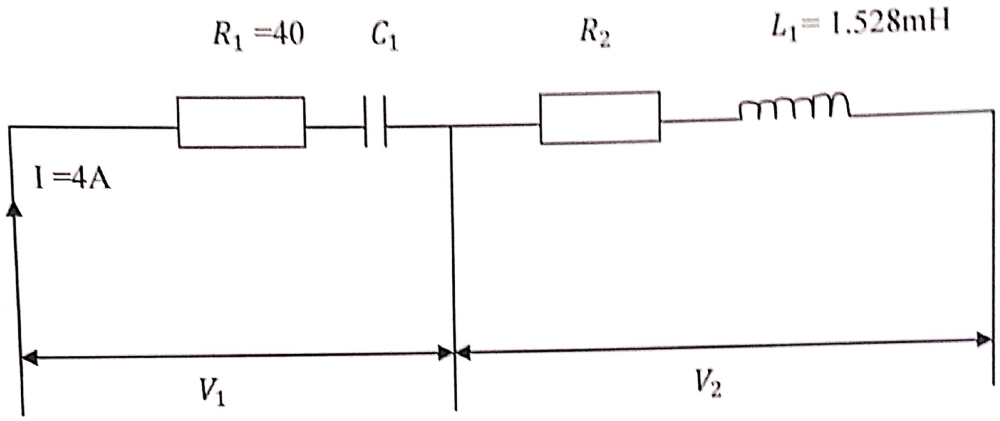

Fig. Q5b

If the supply frequency is 2.5 kHz ,

i. Express V_1 in phasor form and in rectangular form

ii. Express V_2in phasor form and in rectangular form

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

iv. Draw the phasor diagram (16 marks)

Question 6[20 marks]

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 table Fig. Q6b:

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

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

Question 7[20 marks]

a. With reference to 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. Describe the basic principle of operation of a bipolar junction transistor, including why majority carriers crossing into the base from the emitter pass to the collector(7 marks)
c. Using a suitable diagram, explain how a transistor can be used as switch using a light dependent resistor(8 marks)