ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION 2020/2021 ACADEMIC SESSION

COURSE TITLE: BASIC ELECTRICAL ENGINEERING I

COURSE CODE: GNE 223

EXAMINATION DATE: 26th MARCH, 2021

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.

ii. the maximum current

iii. the voltage across the capacitor after 0.6s

iv. the current flowing after one time constant

v. the voltage across the resistor after 0.1s

vi. the time for the capacitor voltage to reach 48V and

vii. the initial rate of voltage rise (10 marks)

Question 4

a. (i) Show that the admittance Y in an R-C series circuit is given by the expression below:

$$Y = \frac{R}{Z^2} + j\frac{X_C}{Z^2}$$ (4 marks)

(ii) Describe the operation and construction of a half wave rectification (4 marks)

b. i. a Convert the network shown in Fig Q5 to an equivalent Thevenin's or Norton's circuit

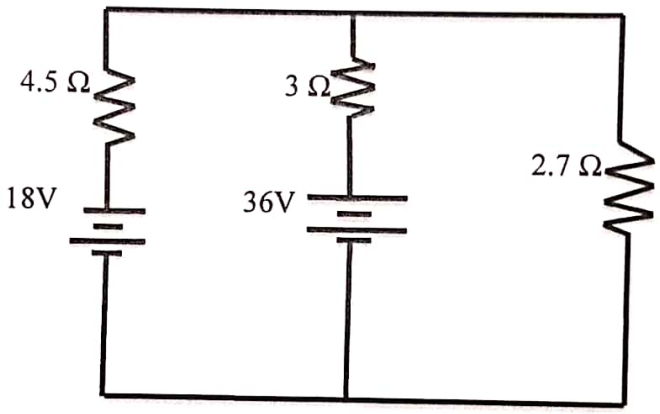

Fig Q5

b Hence determine the current flowing in the 2.7 Ω resistor using Thevenin's theorem, Norton's theorem, Kirchhoff's theorem (12 marks)

Question 5

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 figure Q6 are represented by $V_1 = 236.174 \sin(15710t - 12.68^0)$, $V_2 = 147.078 \sin(15710t + 67.38^0)$

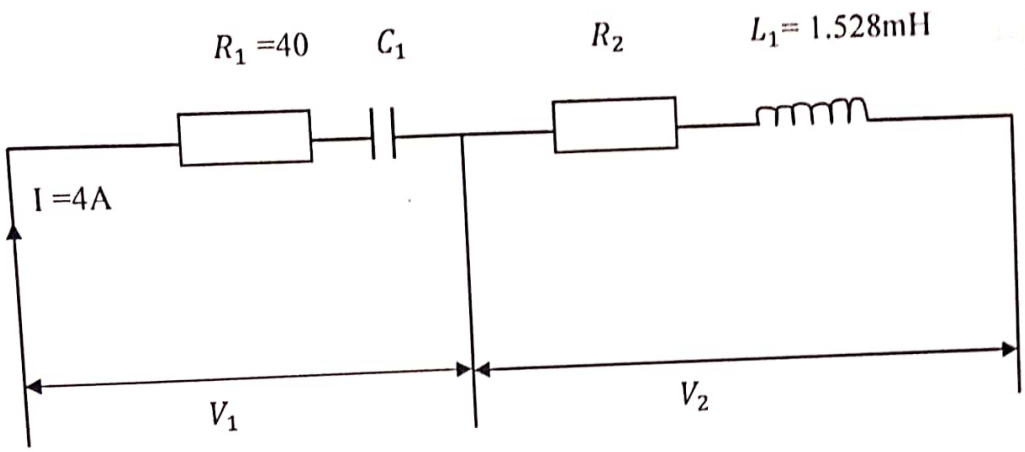

Fig Q6

The supply frequency is 2.5kH.

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 (16 marks)

Question 6

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

i. forward bias
ii. reverse bias
iii. contact potential
iv. depletion layer (8 marks)

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

V_{BE} (V)	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
I_B(μA)	0	0	0	0	1	2.8	20	58	132

Plot the I_B/V_{BE} characteristic for the device and use it to determine
(a) the value of I_B when V_{BE} = 0.67V,
(b) the static value of input resistance when V_{BE} = 0.67V, and
(c) the dynamic value of input resistance when V_{BE} = 0.67V (12 marks)

Question 1

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

b. What is the resistance of a five bands colour code resistor when the five bands are : yellow, violet, yellow, orange and gold? (2 marks)

c. Determine the loop equations when the close circuits are meshed with currents in the network shown in Fig. Q1

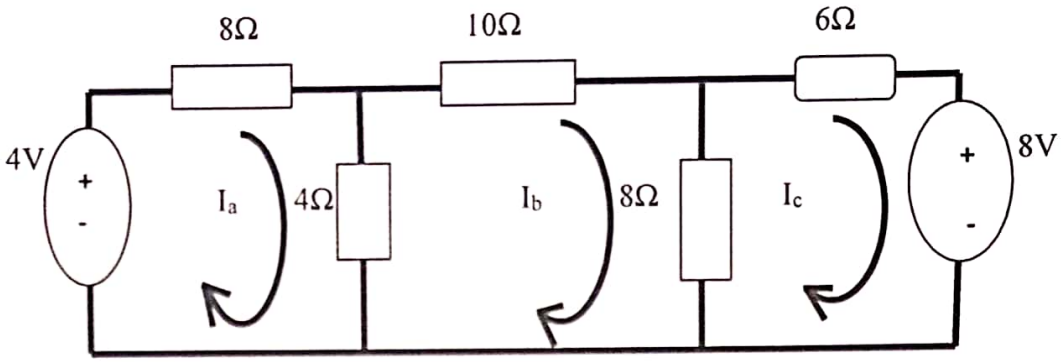

Fig Q1

ii. Determine the voltages and the power dissipated in each of the 4Ω and 10 Ω resistors using Loop analysis (13 marks)

Question 2

a. Differentiate between the following elements: bilateral, unilateral, lumped and distributive elements (4 marks)

b. Determine the current in the 6Ω resistor shown in Fig Q2 using nodal analysis or superposition theorem (8 marks)

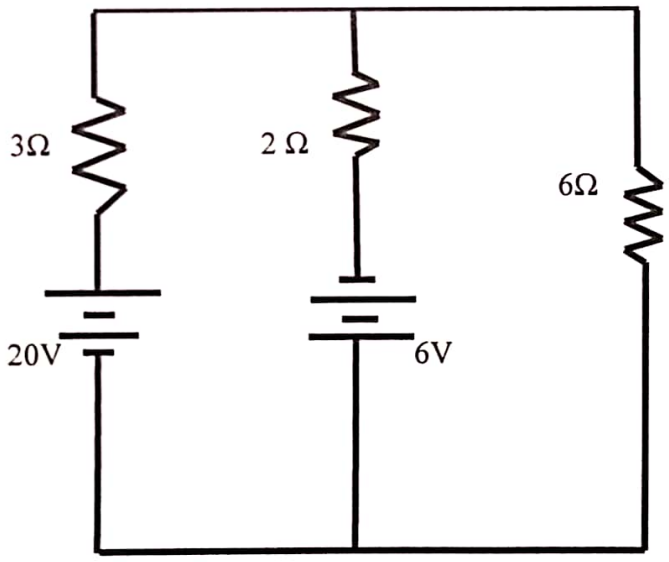

Fig Q2

Question 7

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

b. Using 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) of the networks shown in Fig Q7

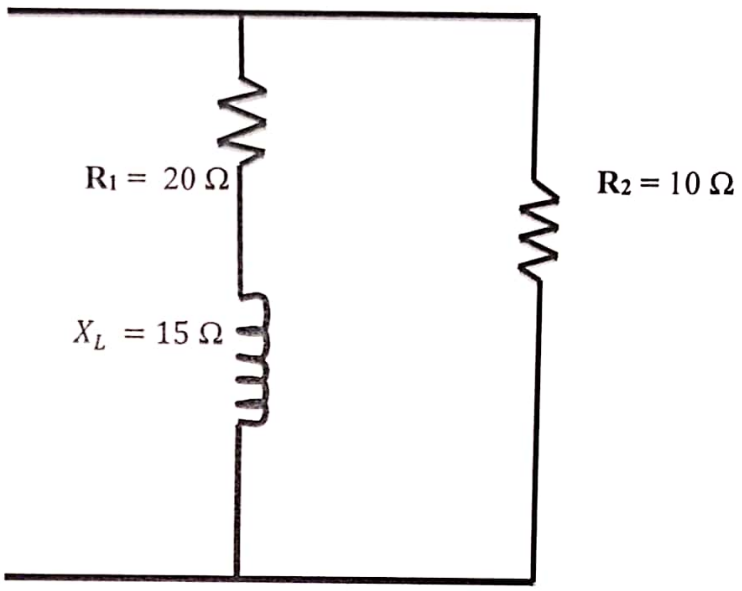

Fig Q7

(7 marks)

c i. Convert the network shown in Fig. Q3 to an equivalent Thevenin's circuit

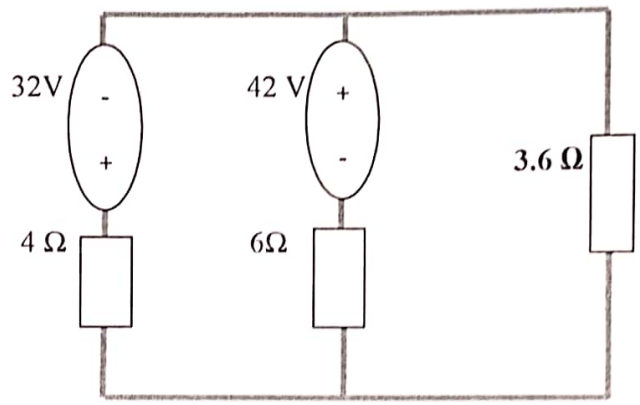

Fig Q3

ii) Determine the current flowing in the **3.6 Ω** resistor using Thevenin's theorem or Kirchhoff's theorem (8 marks)

Question 3

a. i. Explain the meaning of the following terms:

(i) Transient and

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

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

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

b. The circuit shown in figure Q4 is a 24 μF uncharged capacitor connected in series with a 15 k Ω resistor and the circuit is switched to a 120V, d.c. supply.

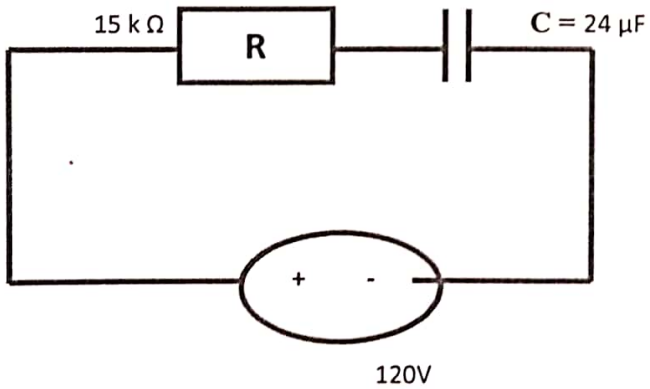

Fig. Q4

Determine:

i. the time constant