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(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE OF

BACHELOR OF SCIENCE IN RENEWABLE ENERGY TECHNOLOGY

COURSE CODE: ECE 102

COURSE TITLE: CIRCUIT THEORY

DATE: Monday, April 25th , 2022 TIME: 3.00 - 5.00 PM

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other TWO (2) questions

Marks will be awarded for correct working even if the answer is wrong

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 7 Printed Pages. Please Turn Over.

SECTION A

Question one

a) What is a source as used in electrical circuits? List any two types of electrical sources commonly used. (4mks)

b) With aid of diagrams differentiate between dependent and independent electrical sources. (5mks)

c) State two applications where the compensation theorem is particularly useful to be applied. (2mks)

d) From Figure 1D compute the ratio of i_1/i. (5mks)

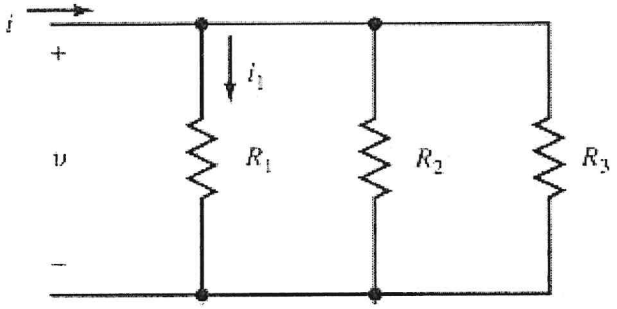

Figure 1D

e) List and briefly explain three important terms associated with an alternating quantity. (4.5mks)

f) Define the RMS value of an alternating quantity and give the RMS expressions for current. (3mks)

g) A parallel circuit comprises of a resistor of 20Ω in series with an inductive reactance 15Ω in one branch and a resistor of 30Ω in series with a capacitive reactance of 20Ω in the other branch as in Figure 1G. Determine the current and power dissipated in each branch if the total current drawn by the parallel circuit is $10\angle -30\ ^{o}A$. (6.5mks)

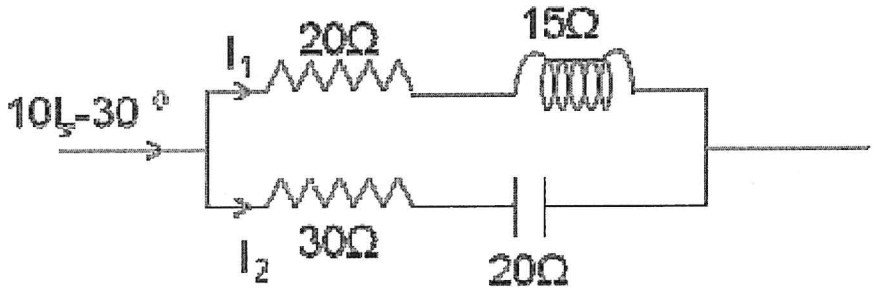

Figure 1G

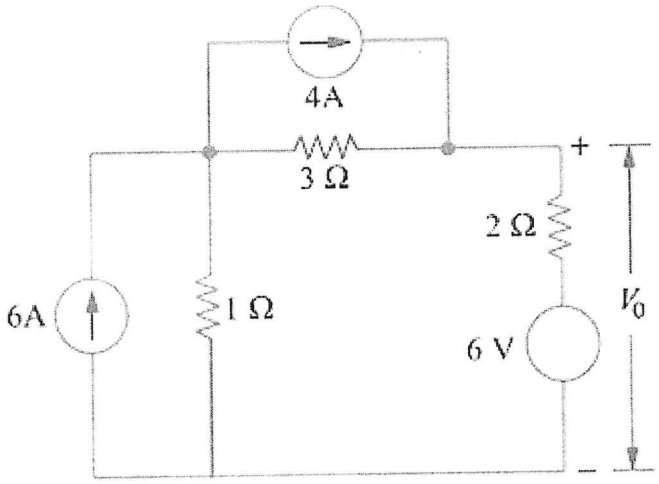

Figure 2C.

Question three

a) State two applications where the compensation theorem is particularly useful to be applied. (4mks)

b) Calculate the values of new currents in the network illustrated in Figure 3B when the resistor R_3 is increased by 30 %. (8mks)

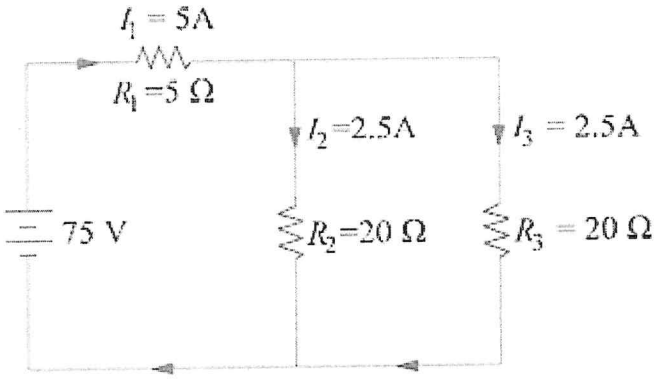

Figure 3B.

c) Calculate the currents in the various branches of the network shown in Figure 3C and then utilize the principle of Superposition and Reciprocity theorem together to find the value of the current in the 1-volt battery circuit when an e.m.f. of 2 volts is added in branch BD opposing the flow of original current in that branch.

(8mks)

Question five

a) From the circuit shown in Figure 5A derive the average power over one cycle. (5mks)

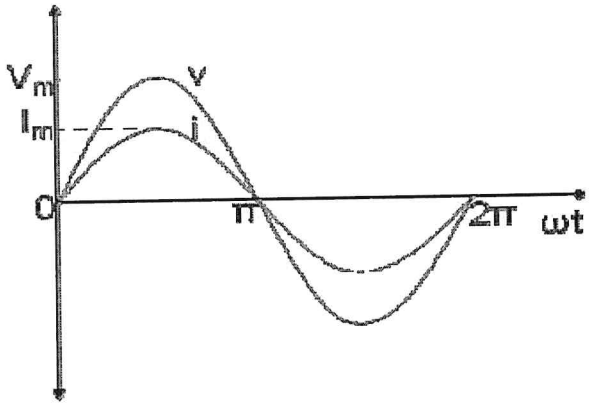

Figure 5A.

b) For the circuit shown in Figure 5B determine the branch voltage and currents and power delivered by the source using mesh analysis. (9mks)

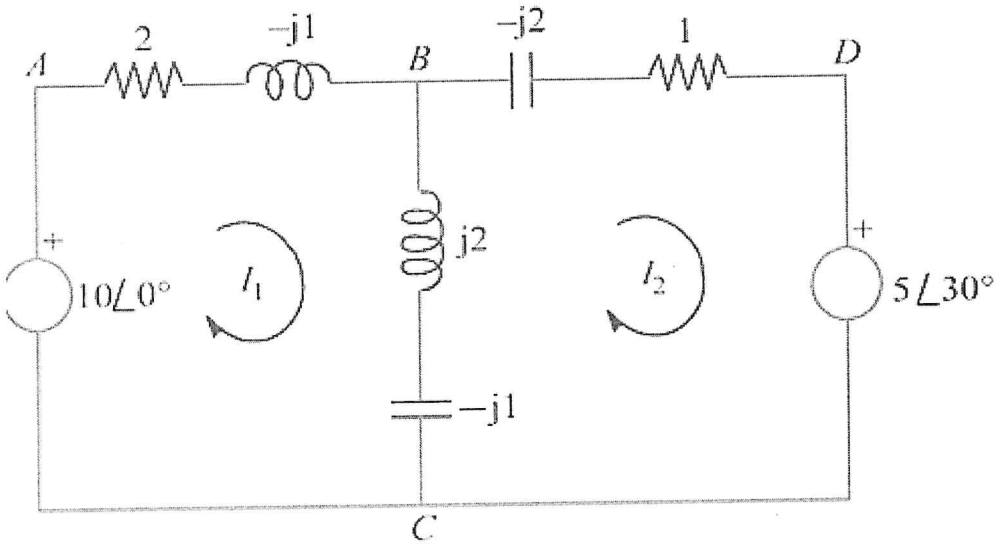

Figure 5B

c) Use Nodal analysis to calculate the current flowing in each branch of the network shown in Figure 5C. (6mks)