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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2018/2019 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER REGULAREXAMINATION

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COM 215

COURSE TITLE: ELECTRICAL CIRCUITS

DATE: 13TH DECEMBER, 2018 **TIME: 9.00 AM – 12.00 NOON**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 5 PRINTED PAGES **PLEASE TURN OVER**

INSTRUCTIONS TO CANDIDATES

i. *Answer ALL Questions from section A and any other THREE questions.*

ii. *Maps and diagrams should be used whenever they serve to illustrate the answer*

iii. *Do not write on the question paper*

SECTION A (24 MARKS) COMPULSORY

QUESTION ONE (12 Marks)

a. Find the total charge in a cylindrical conductor (solid wire) and compute the current flowing in the wire. 5 Marks

b. State Kirchhoff's voltage and current laws. 3 Marks

c. Apply both KVL and KCL to each of the two circuits depicted in Figure 1a & 1b below to obtain equations for each of the two circuits by applying KCL and KVL. 8 Marks

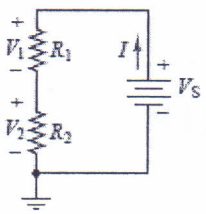


Fig. 1a

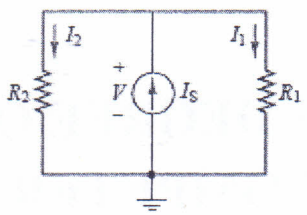


Fig. 1b

d. Determine the voltage v3 in the circuit of Figure 2. 4 Marks

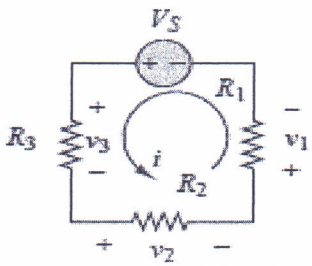


Fig. 2

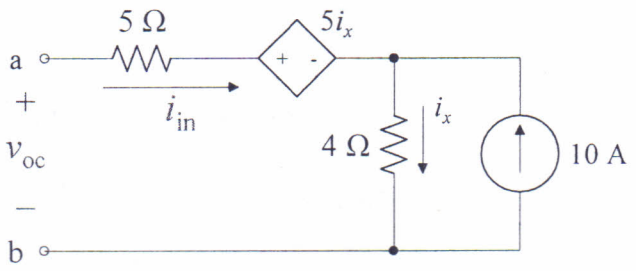
QUESTION TWO (12 Marks)

a) State Superposition theorem. (3 Marks)

b) A 200 V, 50 Hz, inductive circuit takes a current of 10A, lagging 30 degree. Find

(i) the resistance

Figure 5

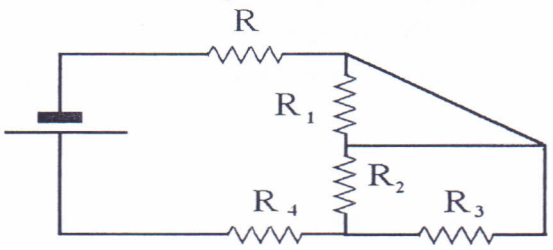


QUESTION FIVE (12 Marks)

a. A wire carries a steady current of 0.1 A over a period of 20 s. What total charge passes through the wire in this time interval? (4 Marks)

b. A metallic conductor has a resistivity of $18 \times 10^{-6}\Omega\cdot m$. What is the resistance of a piece that is 30 m long and has a uniform cross-sectional area of 3.0 mm^2? (4 Marks)

c. If $R_1 = R_2 = R_3 = R_4 = 10\Omega$ and R = 20 Ω, what is the equivalent resistor of the circuit? (4 Marks)



QUESTION SIX (12 Marks)

a. State Thevenin's theorem and by use of diagram(s), explain its application in electrical circuits analysis. (3 Marks)

b. From first principles, prove that in a series circuit for three resistors R_1, R_2, and R_3, the effective resistance (R_{eff}) is given by $R_{eff} = R_1 + R_2 + R_3$ (3 Marks)

c. Define Laplace transform of a function f(t); hence find the Laplace transforms for the function (3Marks)

d. Explain the operation of a series circuit. (3 Marks)

QUESTION SEVEN (12 Marks)

a. State Norton's theorem and by use of an appropriate diagram explain its application in electrical circuit analysis. (4 Marks)

b. Define the following terms as applied in electrical principles circuitries: (4 Marks)

i. Impedance
ii. Resonance
iii. Reactance
iv. Conductance

c. Explain the operation of a parallel circuit, hence from first principles prove that in a parallel circuit for the three resistors R_1, R_2, and R_3, the resistance (R_{eff}) is given by $R_{eff} = R_1R_2R_3/(R_1R_2+R_2R_3+R_3R_1)$ (4 Marks)

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