(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATIONS

YEAR ONE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF (COMPUTER SCIENCE)

COURSE CODE: CSC 116

COURSE TITLE: ELECTRICAL PRINCIPLES

DATE: 24/09/2021 TIME: 11.00 A.M – 01.00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO (2) QUESTIONS

QUESTION ONE (COMPUSORY) [30 MARKS]

a) Differentiate between direct current and alternating current [2mks]

b) Differentiate between resistance and reactance [2mks]

c) An inductor has a 54.0Ω reactance at 60Hz. What will be the maximum current if this inductor is connected to a 50Hz source that produces 100V rms. [5mks]

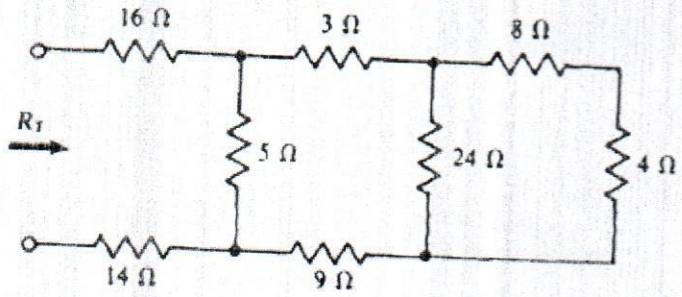
d) How long must a current of 300mA flow so as to transfer a charge of 40 C? [3mks]

e) The current flowing through a resistor is 0.16A when a p.d. of 10V is applied. Determine the value of the resistance. [3mks]

f) A 200V battery is connected across a resistor and causes a current of 10mA to flow. Determine the resistance of the resistor. If the voltage is now reduced to 20V, what will be the new value of the current flowing? [6mks]

g) Calculate the power dissipated when a current of 20mA flows through a resistance of 4.5kΩ. [2mks]

h) Find the total resistance R, of the resistor ladder network shown in Fig.1b [4mks]



i) Determine the resistance of a light bulb that uses an average of 75W when connected to a 60Hz power source with a peak voltage of 170V. [3mks]

QUESTION TWO [20 MARKS]

a) Explain the effect on brightness of light bulbs when connected in

i) Series [2mks]

ii) Parallel [2mks]

b) Define power factor in ac circuits [2mks]

c) A hair dryer with a resistance of 12.0Ω and a lamp with a resistance of 125 Ω are connected in parallel to a 125-V source through a 1.50- Ω resistor in series. Find the current through the lamp when the hair dryer is on. [9mks]

d) A current of 10A flows in the winding of an electric motor, the resistance of the winding being 200Ω. Determine the

(a) P.d. across the winding [2mks]

(b) Power dissipated by the coil. [3mks]

QUESTION THREE [20 MARKS]

a) Briefly explain how mesh technique is used to analyze an electric circuit [5mks]

b) The resistance of 1.5 km of wire of cross-sectional area 0.17 mm^2 is 150 Ohm. Determine the resistivity of the wire. [3mks]

c) A coil of copper wire has a resistance of 20 ohm at 18°C. If the temperature coefficient of resistance of copper at 18°C is 0.004/°C, determine the resistance of the coil when the temperature rises to 98°C [4mks]

d) Find the mesh currents in the circuit shown in Fig. 3. [8mks]

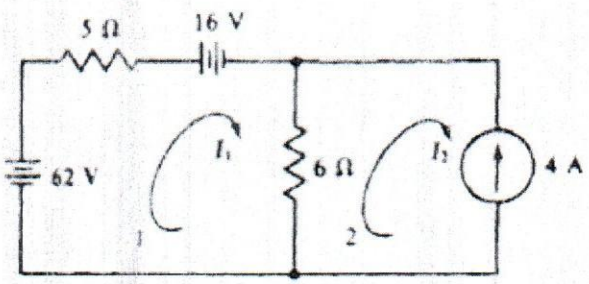


Figure 3

QUESTION FOUR [20 MARKS]

a) State Kirchhoff's current and voltage laws [4mks]

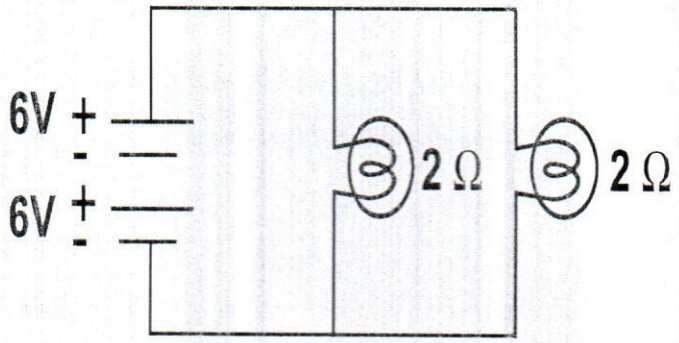
b) Using the parallel circuit of figure 4a calculate:

i) The voltage for the circuit [1mk]

ii) The current flow through each branch [1mk]

iii) The total current [1mk]

iv) The voltage in each branch [1mk]



c) When a 4.0μF capacitor is connected to a generator whose rms output voltage is 30V, the current in the circuit is observed to be 0.30A. What is the frequency of the source? [5 mks]

d) Calculate the value of voltage V in Fig. 4d. [3 mks]

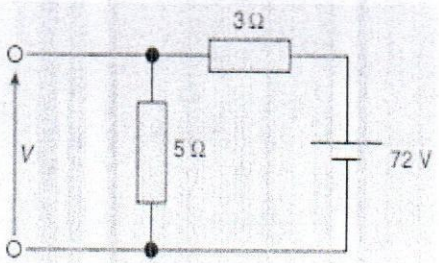
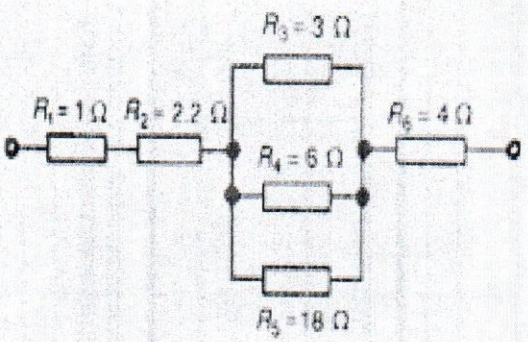


Figure 7

e) Find the equivalent resistance for the circuit shown in Fig. 4e. [4mks]



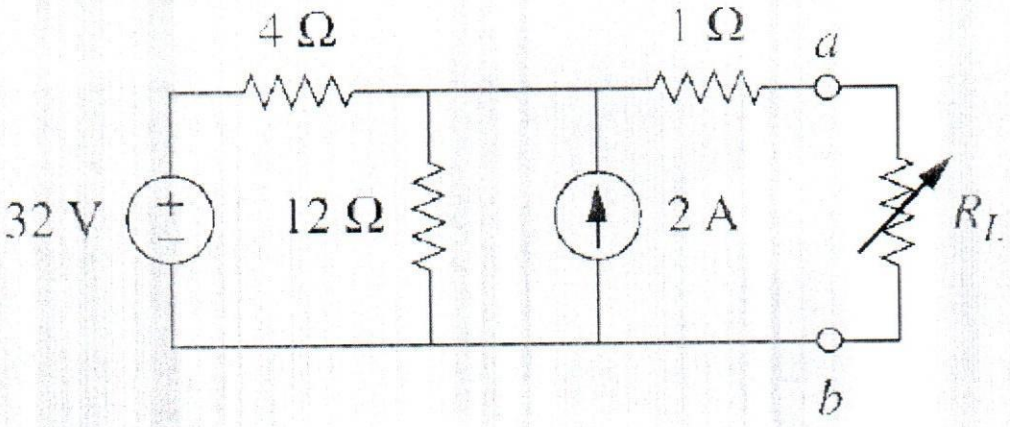
QUESTION FIVE [20 MARKS]

a) With the help of diagrams, list the steps followed when applying Thevenin's theorem to obtain:

i) The Thevenin resistance [2mks]

ii) The Thevenin voltage [2mks]

b) Find the Thevenin's equivalent circuit of the circuit shown below in fig. 5a. to the left of the terminals a-b. Then find the current through R_L= 6Ω, 16Ω, and 36Ω. [7mks]



c) Find currents I_3, I_4 and I_6 in Fig. 5b [5mks]

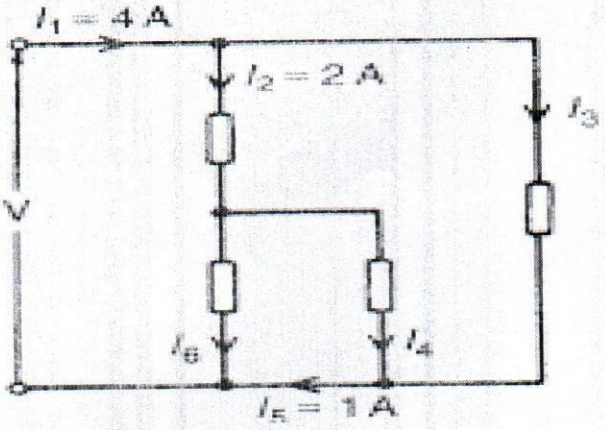


Figure 9

d) An e.m.f. of 200V at a frequency of 2 kHz is applied to a coil of pure inductance 50 mH. Determine

(a) Reactance of the coil, and [2mk]

(b) Current flowing in the coil. [2mk]