

(Knowledge for Development)

KIBABII UNIVERSITY

2021 /2022 ACADEMIC YEAR

UNIVERSITY SPECIAL/SUPPLEMENTARY

YEAR ONE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF

COMPUTER SCIENCE

COURSE CODE: CSC 116

COURSE TITLE: ELECTRICAL PRINCIPLES

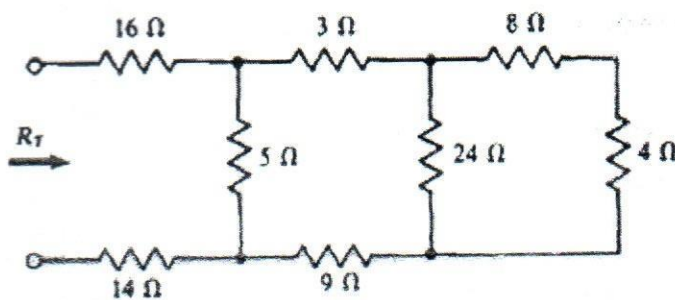
DATE: 22/07/2022 TIME: 02.00 P.M – 04.00 P.M

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 $4.5\text{k}\Omega$. [2mks]
- h) Find the total resistance R_T , 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 125Ω are connected in parallel to a 125-V source through a $1.50\text{-}\Omega$ 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 ohms . Determine the resistivity of the wire. [3mks]
- c) A coil of copper wire has a resistance of 20 ohms at 18°C . If the temperature coefficient of resistance of copper at 18°C is $0.004/^\circ\text{C}$, 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]

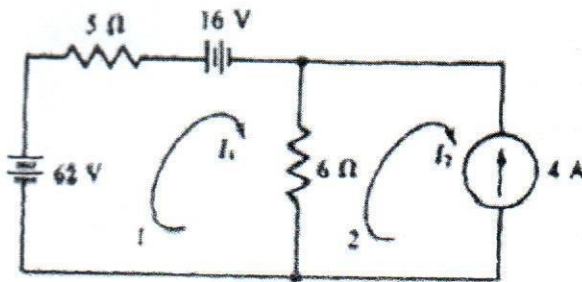
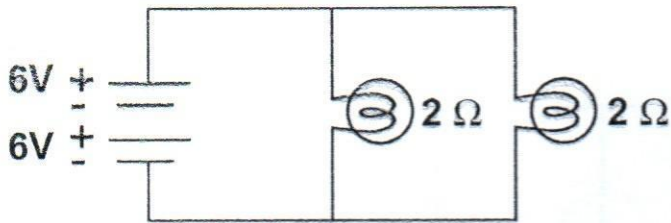


Figure 3

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 $4.0\mu\text{F}$ 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? [5mks]
- d) Calculate the value of voltage V in Fig. 4d. [3mks]

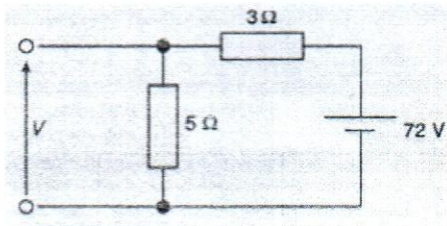
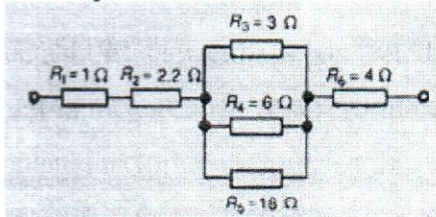


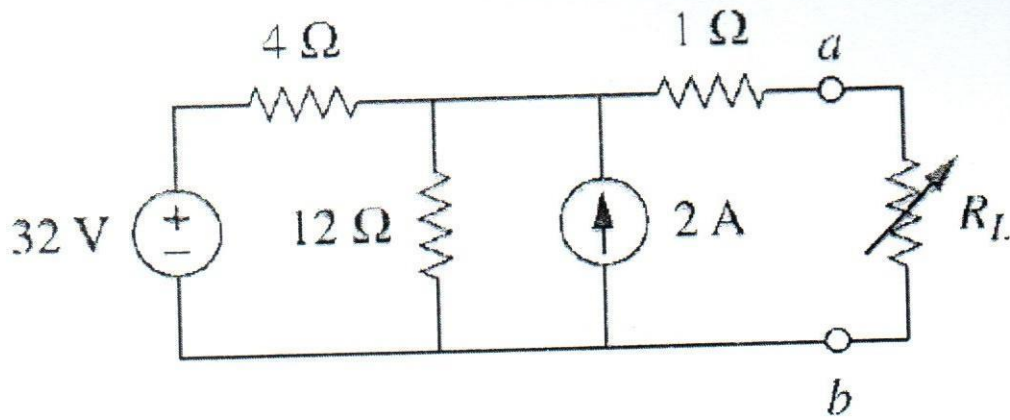
Figure 7

- 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:
- The Thevenin resistance [2mks]
 - 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 $R_L = 6\Omega, 16\Omega,$ and 36Ω . [7mks]



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

[5mks]

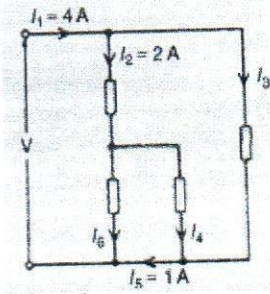


Figure 9

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]