

(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**

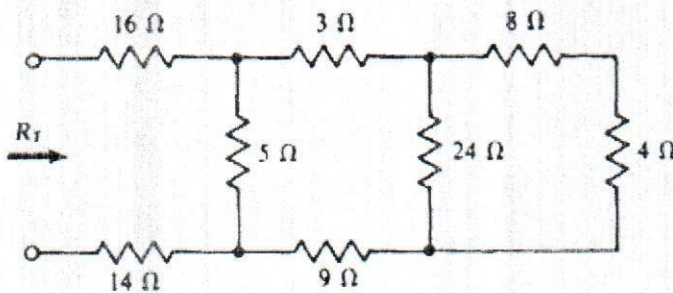
**INSTRUCTIONS TO CANDIDATES**

**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  $54.0\Omega$  reactance at  $60\text{Hz}$ . What will be the maximum current if this inductor is connected to a  $50\text{Hz}$  source that produces  $100\text{V rms}$ . [5mks]
- d) How long must a current of  $300\text{mA}$  flow so as to transfer a charge of  $40\text{ C}$ ? [3mks]
- e) The current flowing through a resistor is  $0.16\text{A}$  when a p.d. of  $10\text{V}$  is applied. Determine the value of the resistance. [3mks]
- f) A  $200\text{V}$  battery is connected across a resistor and causes a current of  $10\text{mA}$  to flow. Determine the resistance of the resistor. If the voltage is now reduced to  $20\text{V}$ , what will be the new value of the current flowing? [6mks]
- g) Calculate the power dissipated when a current of  $20\text{mA}$  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  $75\text{W}$  when connected to a  $60\text{Hz}$  power source with a peak voltage of  $170\text{V}$ . [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  $12.0\Omega$  and a lamp with a resistance of  $125\Omega$  are connected in parallel to a  $125\text{-V}$  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  $10\text{A}$  flows in the winding of an electric motor, the resistance of the winding being  $200\Omega$ . 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  $1.5\text{ km}$  of wire of cross-sectional area  $0.17\text{ mm}^2$  is  $150\text{ Ohm}$ . Determine the resistivity of the wire. [3mks]
- c) A coil of copper wire has a resistance of  $20\text{ ohm}$  at  $18^\circ\text{C}$ . If the temperature coefficient of resistance of copper at  $18^\circ\text{C}$  is  $0.004/^\circ\text{C}$ , determine the resistance of the coil when the temperature rises to  $98^\circ\text{C}$  [4mks]
- d) Find the mesh currents in the circuit shown in Fig. 3. [8mks]

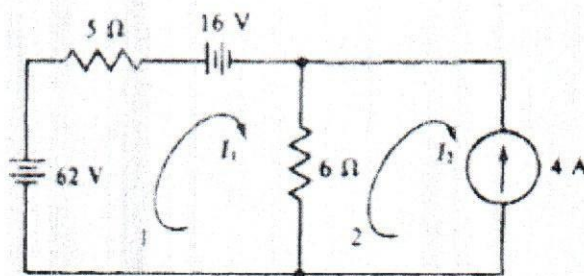
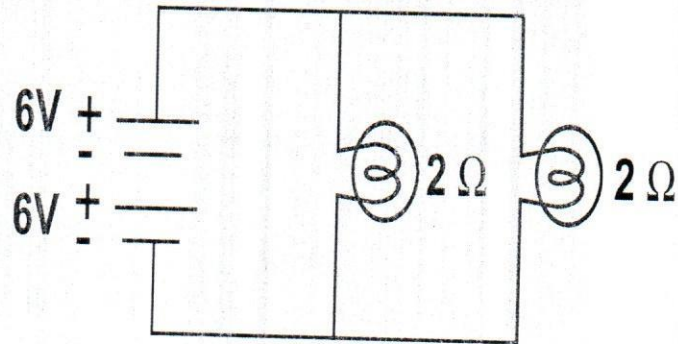


Figure 3

### 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  $30\text{V}$ , the current in the circuit is observed to be  $0.30\text{A}$ . What is the frequency of the source? [5 mks]
- d) Calculate the value of voltage  $V$  in Fig. 4d. [3 mks]

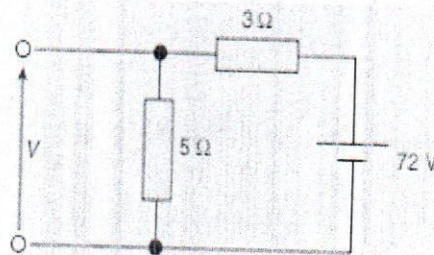
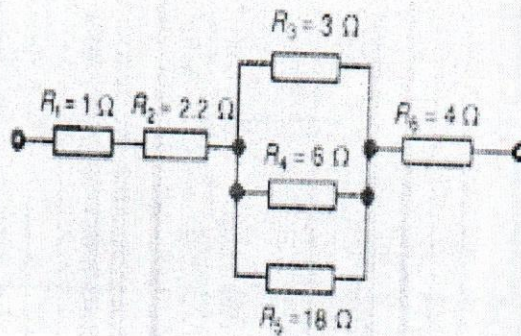


Figure 7

- 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

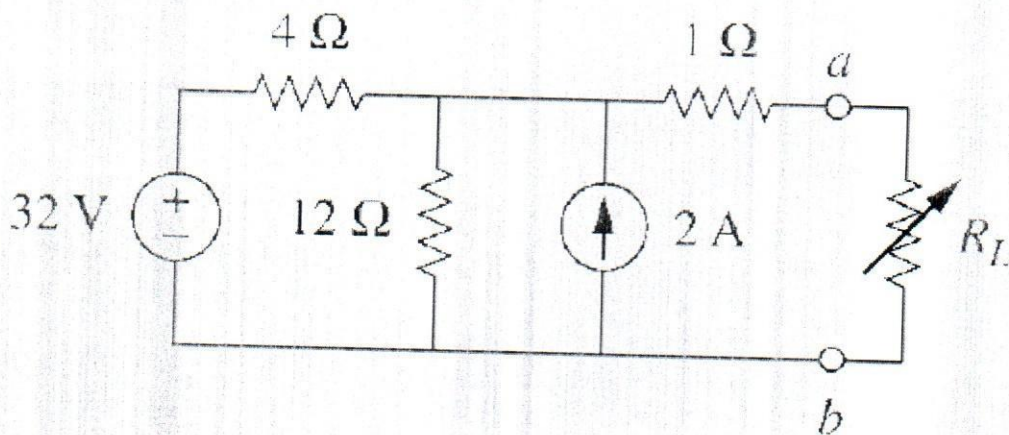
[2mks]

ii) The Thevenin voltage

[2mks]

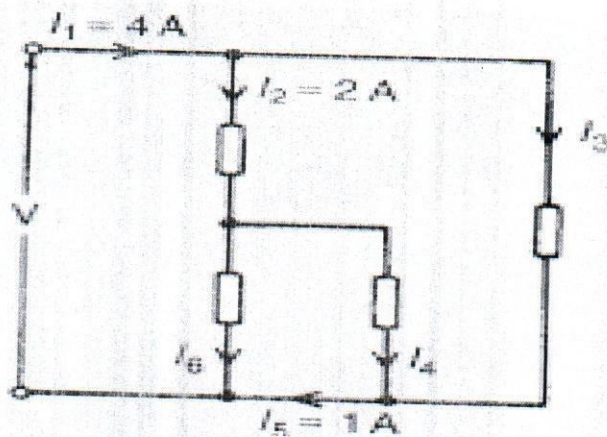
b) Find the Thevenin's equivalent circuit of the circuit shown below in fig. 5a, to the left of the terminals a-b. Then find the current through  $R_L = 6\Omega$ ,  $16\Omega$ , and  $36\Omega$ .

[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]