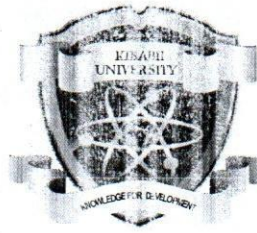*(Knowledge for Development)*

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS
(JAN INTAKE)

FOR THE DEGREE OF
BACHELOR OF SCIENCE
(COMPUTER SCIENCE)

COURSE CODE   :   CSC 116
COURSE TITLE   :   ELECTRICAL PRINCIPLES

DATE: WEDNESDAY 12ᵀᴴ, MAY 2021 TIME: 2.00 P.M -4.00 P.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE [COMPULSORY] [30 MARKS]

a) Calculate the resistance of a copper cable with length 3200 meters and cross section 240 mm² [3 marks]

b) Calculate the resistance of the heating element in a toaster rated at 1.2kw, 240V. [3marks]

c) Determine the current rating of a fuse whose resistance is 1 ohm and a maximum power rating of 0.25W. [2 marks]

d) For the circuit of figure 1, Calculate

    i) The equivalent resistance [3 marks]

    ii) The supply voltage V in the circuit shown. [6 marks]
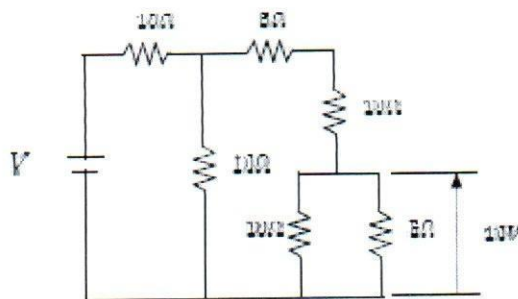
Figure 1

e) The terminal voltage of an open current source is 450V and its short circuit current is 18A. Calculate the internal resistance of the source. [2 marks]

f) Determine the voltage v3 in the circuit of Figure 2, given that $R_1 = 10\Omega$; $R_2 = 6\ \Omega$; $R_3 = 8\Omega$ and $V_S = 3$ V.
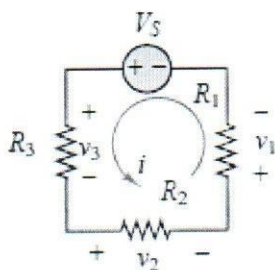
Figure 2

g) Given that the charge stored by a capacitor is *5 µC* and is charged to 50 V, find its capacitance. [2 marks]

h) Three resistors R_1, R_2 and R_3 are connected in series to a 240V dc source. The combined voltage drop across R_1 and R_2 is 165V. The combined voltage drop across R_2 and R_3 is 180V. If the total resistance is 8000 ohms, calculate the resistance of each of the three resistors. [6 marks]

i) Three lamps operating in parallel on a 240V line are rated at 30W, 40W and 50W respectively. Determine the equivalent resistance of this load. [3 marks]

QUESTION TWO [20 MARKS]

a) Three resistors connected in parallel draw a total of 20mA from the source. If the resistor values are 8kΩ, 20kΩ and 40kΩ respectively, calculate the current flowing through each resistor [5 marks]

b) Using the circuit of figure 3, calculate:

   i) The equivalent resistance of the network when the load current is zero [5 marks]

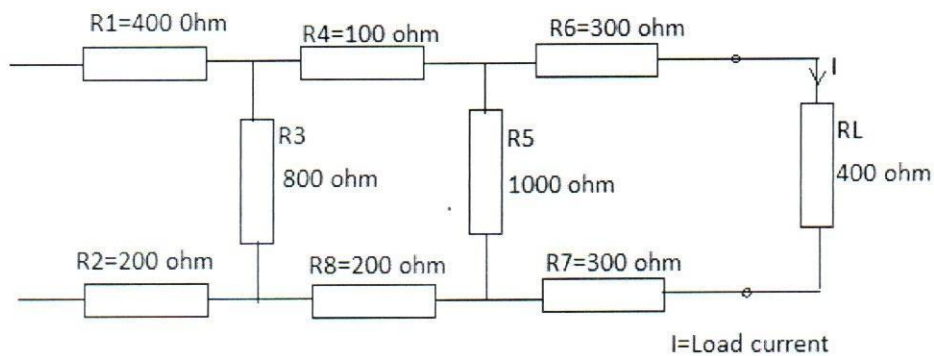   ii) The input voltage when the load current is 10mA. [2 marks]

Figure 3

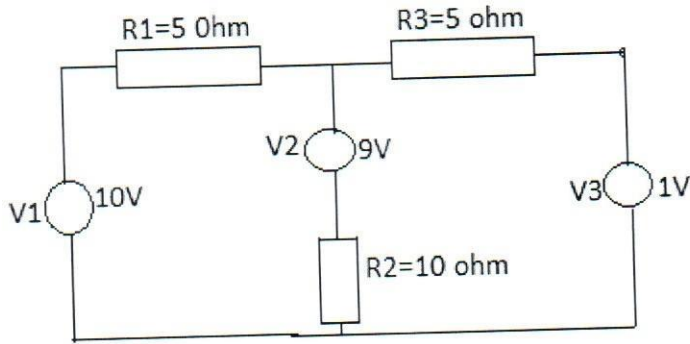c) Find the mesh currents in the circuit of Figure 4 [8 marks]

Figure 4

d) Three capacitors A, B, C have capacitances 10, 50 and 25 µF respectively. Calculate:

    i)   Charge on each capacitor when connected in parallel to a 250V supply. [2marks]

    ii) The total capacitance   [1 mark]

    iii) P,d across each when connected in series.   [2 marks]

QUESTION THREE [20 MARKS]

a) In a given R-L circuit, $R=3.5\Omega$ and $L=0.1H$. find

    i)   The current through the circuit   [3 marks]

    ii) The power factor if a 50-Hz voltage $V=250\angle30^0$ is applied across the circuit.

                                                        [5 marks]

b) A resistance of 20 ohms, inductance of 0.2H and a capacitance of 150µF are connected in series across 230V, 50Hz supply. Find:

    i) X_L ii) X_C iii) Z   iv) power factor   v) Active power

    vi) Reactive power   [12 marks]

QUESTION FOUR [20 MARKS]

a) Using Kirchhoff's laws, calculate the current in each branch of the network of Figure 5
below: [10 marks]
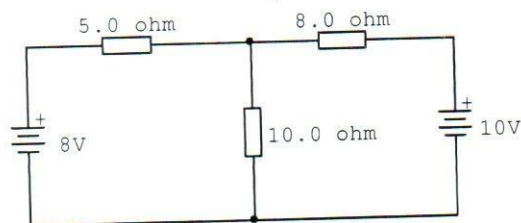

Figure 5

b) A parallel circuit consists of a 200-ohm resistor, an inductance of reactance 100 ohm and a capacitor of reactance 80 ohm across 120V ac source. Determine:

   ii) The branch currents

   iii) The total current

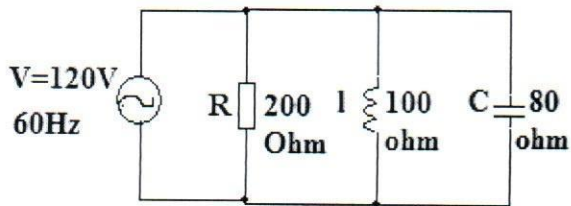   iv) The impedance   [10 marks]

Figure 6

QUESTION FIVE [20 MARKS]

a) Using node voltage method, find the current through the 3-ohm resistor for the network shown in Figure 7.   [8 marks]
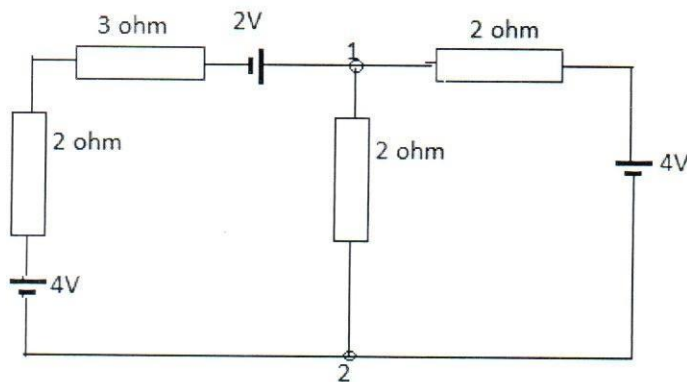

Figure 7

b) Find and solve the node equations of the network of Figure 8. Hence find the power consumed by the passive elements of the network.   [12 marks]
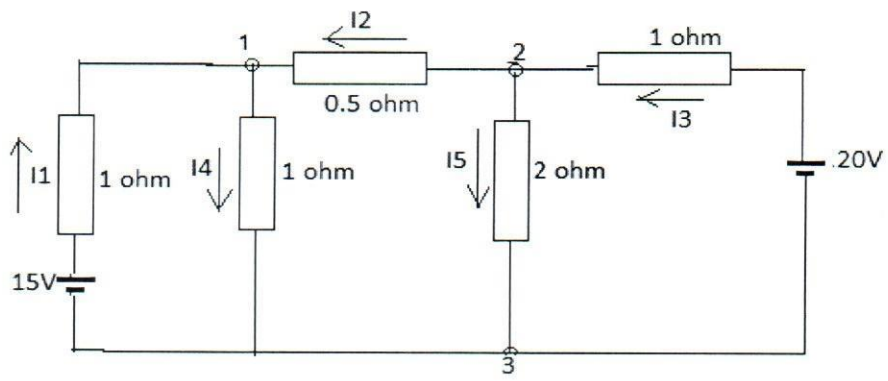
Figure 8