

*(Knowledge for Development)*

## **KIBABII UNIVERSITY**

**UNIVERSITY EXAMINATIONS  
2017/2018 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS  
YEAR ONE SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE OF  
BACHELOR OF SCIENCE COMPUTER SCIENCE**

**COURSE CODE : CSC 116**  
**COURSE TITLE : ELECTRICAL PRINCIPLES**  
**DATE: 10/01/2018 TIME: 2:00 P.M – 4:00 A.M**

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**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 mm<sup>2</sup> [3marks]
- 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. [2marks]
- d) For the circuit of figure 1, Calculate
  - i) The equivalent resistance [3marks]
  - ii) The supply voltage V in the circuit shown. [6marks]

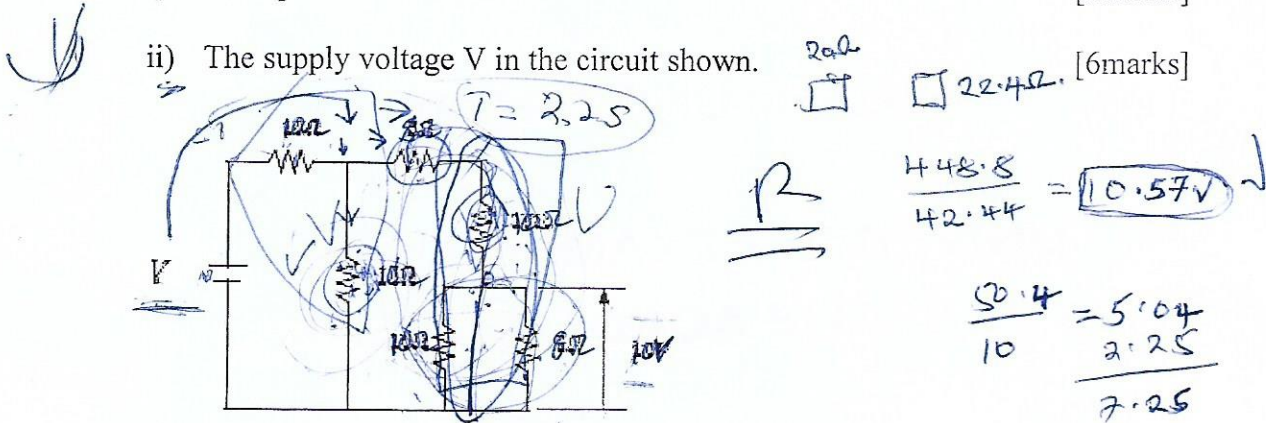


Figure 1

- 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. [2marks]
- f) Determine the voltage  $v_3$  in the circuit of Figure 2, given that  $R_1 = 10\Omega$ ;  $R_2 = 6\Omega$ ;  $R_3 = 8\Omega$  and  $V_S = 3V$ .

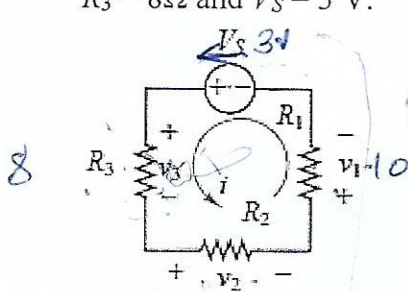


Figure 2

- g) Given that the charge stored by a capacitor is 5  $\mu C$  and is charged to 50 V, find its capacitance. [2marks]
- 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. [6marks]

- 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. [3marks]

**QUESTION TWO (20 Marks)**

- a) Three resistors connected in parallel draw a total of 20mA from the source. If the resistor values are  $8k\Omega$ ,  $20k\Omega$  and  $40k\Omega$  respectively, calculate the current flowing through each resistor [5marks]
- b) Using the circuit of figure 3, calculate:-  
 i) The equivalent resistance of the network when the load current is zero [5marks]  
 ii) The input voltage when the load current is 10mA. [2mark]

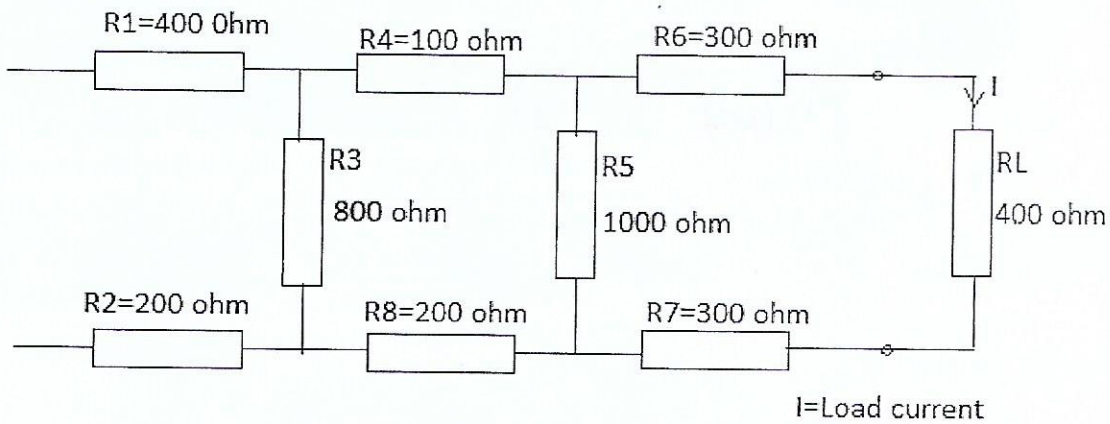


Figure 3

- c) Find the mesh currents in the circuit of figure 6 [8marks]

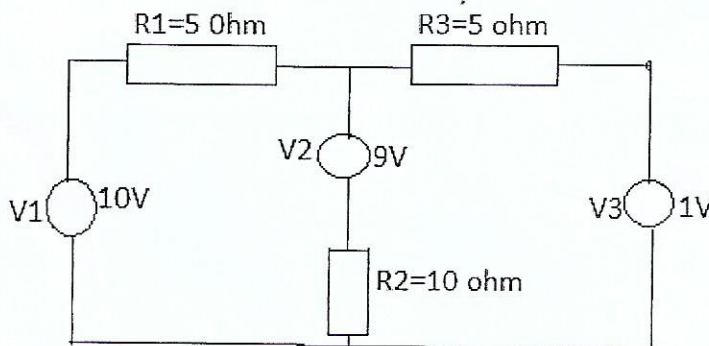


Figure 4

- d) Three capacitors A, B, C have capacitances 10, 50 and  $25 \mu F$  respectively. Calculate:-  
 i) Charge on each capacitor when connected in parallel to a 250V supply. [2marks]  
 ii) The total capacitance [1marks]  
 iii) P,d across each when connected in series. [2marks]

**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 [3marks]
  - ii) The power factor if a 50-Hz voltage  $V=250\angle 30^\circ$  is applied across the circuit. [5marks]
- b) A resistance of 20 ohms, inductance of 0.2H and a capacitance of  $150\mu\text{F}$  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 [12marks]

**QUESTION FOUR [20 MARKS]**

- a) Using Kirchoff's laws, calculate the current in each branch of the network of figure 1 below: [10mks]

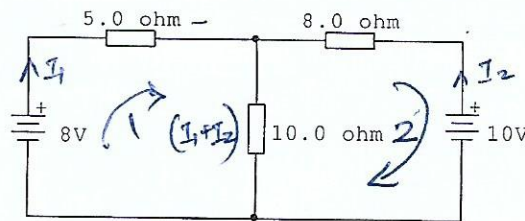


Figure 5

- 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 [10mks]

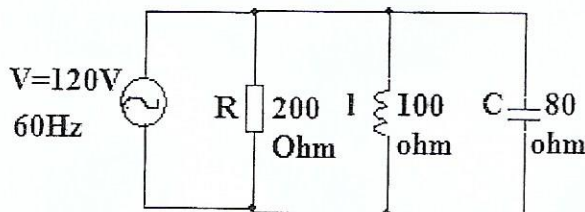


Figure 6

**QUESTION FIVE [20 MARKS]**

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

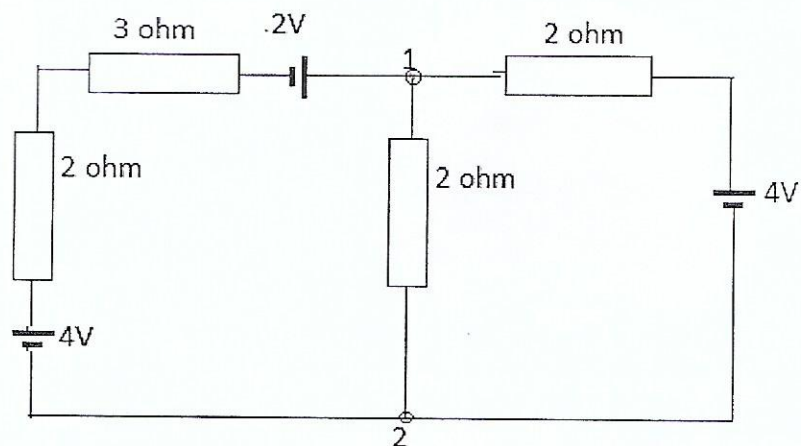


Figure 7

- 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. [12marks]

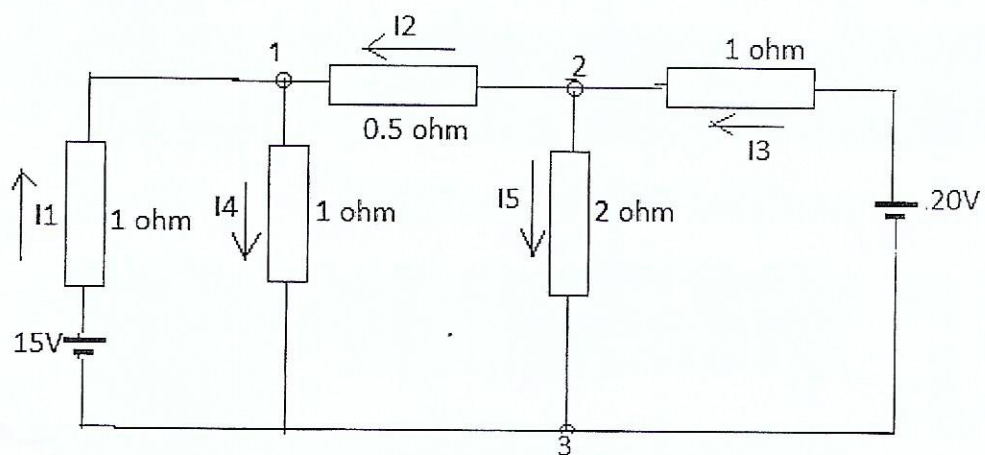


Figure 8