(KNOWLEDGE FOR DEVELOPMENT)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR
END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS
FOR THE BACHELORS DEGREE
COMPUTER SCIENCE

COURSE CODE: **CSC 116**

COURSE TITLE: **ELECTRICAL PRINCIPLES**

DATE: **15/02/2021** **TIME: 2.00 P.M – 4.00 P.M**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO (2) QUESTIONS

QUESTION ONE [COMPUSORY] [30 MARKS]

a) Define electric current in terms of charge and Time [3mks]

b) Calculate the power dissipated when a current of 4mA flows through a resistance of 45kΩ. [3mks]

c) A source e.m.f. of 15V supplies current of 4A for 20 minutes. How much energy is provided in this time? [3mks]

d) i) State Kirchhoff's first law. [3mks]

i) Find the unknown current in Figure 1.1 [3mks]

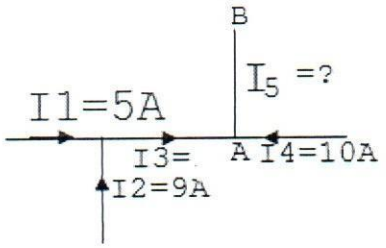


Figure 1d

e) Kirchhoff's first law expresses the conservation of an important physical quantity. Name the quantity that is conserved. [2mks]

f) Find the current I_3 in the node as shown in figure 1.1 [3mks]

g) Several identical cells are used to connect up circuits. Each cell has e.m.f 1.5V. Determine the total e.m.f for the following combinations of cells. [4mks]

i) ii)

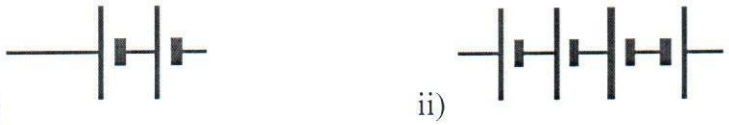


Figure 1.2

h) Use Kirchhoff's second law to calculate the current I in the circuit of figure 1.3 [3mks]

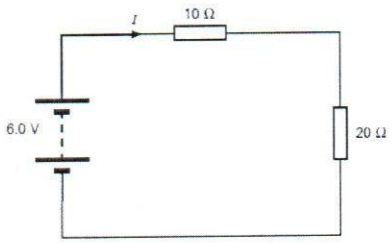


Figure 1.3

k) A capacitor has a reactance of 40Ω when operated on a 50 Hz supply. Determine the value of its capacitance. [3mks]

QUESTION TWO [20 MARKS]

a) Define electrical power and state its unit [3mks]

b) A current of 5A flows in the winding of an electric motor, the resistance of the winding being 100Ω. Determine the

i) p.d. across the winding, [2mks]

ii) Power dissipated by the coil. [2mks]

c) i) Calculate the reactance of a coil of inductance 0.32H when it is connected to a 50 Hz supply. [2mks]

ii) A coil has a reactance of 124Ω in a circuit with a supply of frequency 5 kHz. Determine the inductance of the coil. [2mks]

d) A coil of inductance 159.2mH and resistance 20Ω is connected in series with a 60Ω resistor to a 240V, 50 Hz supply. Determine the

i) Impedance of the circuit, [3mks]

ii) Current in the circuit, [2mks]

iii) p.d. across the 60Ω resistor [2mks]

iv) Draw the circuit phasor diagram showing all voltages. [2mks]

QUESTION THREE [20 MARKS]

a) State superposition theorem [3mks]

b) Use the superposition theorem to determine the current in each branch of the arrangement shown in Fig. 3.1 [10mks]

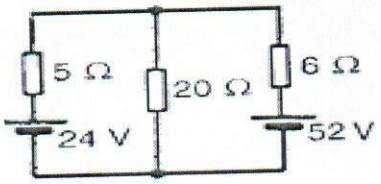


Fig. 3.1

c) Name the units used to measure:

i) the quantity of electricity [1mk]

ii) resistance [1mk]

iii) conductance [1mk]

d) With the aid of a sketch, differentiate between a linear and nonlinear device. [4mks]

QUESTION FOUR [20 MARKS]

a) i) Determine the current flowing when charge of 270 C is transferred in 4 minutes. [3mks]

ii) How long must a current of 200mA flow so as to transfer a charge of 100 C? [3mks]

b) State Thévenin's theorem [3mks]

c) Determine the current in the 5Ω resistance of the network shown in Fig. 4.1 using Thévenin's theorem. Hence find the currents flowing in the other two branches. [7mks]

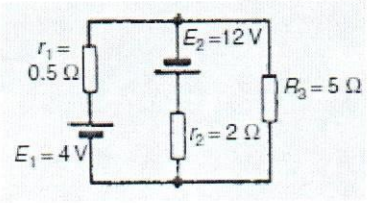
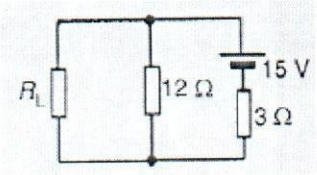


Fig.4.1

d) For the circuit in figure 4d, find the value of the load resistor R_L that gives maximum power dissipation and determine the value of this power. [4mks]



QUESTION FIVE [20 MARKS]

a) The current flowing through a resistor is 0.85A when a p.d. of 12V is applied. Determine the value of the resistance. [3mks]

b) State Norton's theorem [3mks]

c) From the circuit shown in figure 5c determine the current through the 10Ω resistor using (a) Thévenin ' s theorem, and (b) Norton ' s theorem. [10mks]

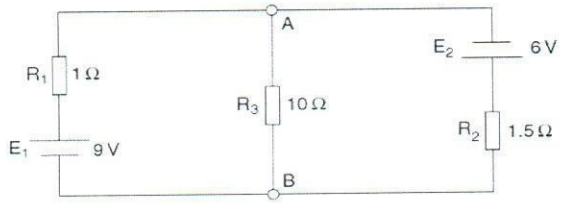


Fig. 5c

d) Convert the circuit shown in Fig. 5d to an equivalent Thevenin network. [4mks]