



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

SMA 130: INTRODUCTION TO ELECTRONICS

DATE: 25/2/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer question ONE and any other TWO questions.

QUESTION ONE (30 MARKS)

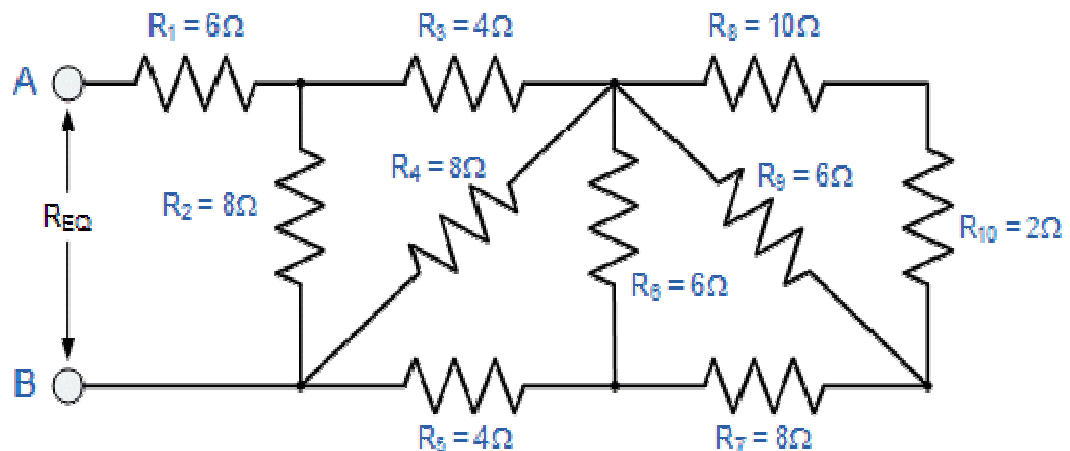
- (a)
 - (i) Briefly explain the significance of electronics in our day-to-day lives. (2 marks)
 - (ii) Outline FOUR application areas of electronics. (4 marks)
- (b) With regard to electronics define the following terms giving a suitable application area of each:
 - (i) Circuit
 - (ii) Analog
 - (iii) Digital (6 marks)
- (c) Discuss any TWO limitations of analog electronics. (2 marks)
- (d) Distinguish TWO broad categories of electronic components giving an example of each. (4 marks)
- (e) State the functions of the following electronic components and draw the corresponding circuit symbols for each one of them.
 - (i) Fuse
 - (ii) Transformer
 - (iii) Inductor (6 marks)
- (f) Using suitable example diagrams differentiate a parallel circuit from a serial circuit. (6 marks)

QUESTION TWO (20 MARKS)

- (a) (i) Define the term capacitance as used in electronics. (2 marks)
- (ii) With regard to capacitors, state the meaning of the term dielectric. (2 marks)
- (b) A circuit diagram consists of four capacitors such that three of them are arranged in parallel, while the fourth one is in series with the three.
- (i) Draw an appropriate circuit diagram to illustrate this requirement. (4 marks)
- (ii) Using adequate explanations, calculate the total overall capacitance of the circuit, given that the parallel capacitors have energies of 3F, 2F and 1F while the fourth capacitor has energy of 4F. (4 marks)
- (iii) Calculate the total overall capacitance if all capacitors were connected in:
1. Series (4 marks)
 2. Parallel (4 marks)

QUESTIONS THREE (20 MARKS)

- (a) Define the following terms and state their units of measurement.
- (i) resistance
- (ii) conductance (4 marks)
- (b) Name any FOUR types of resistors. (4 marks)
- (c) (i) Differentiate between Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL). (2 marks)
- (ii) Name THREE rules governing Kirchhoff's Voltage Law (KVL). (3 marks)
- (iii) Consider the following diagram.

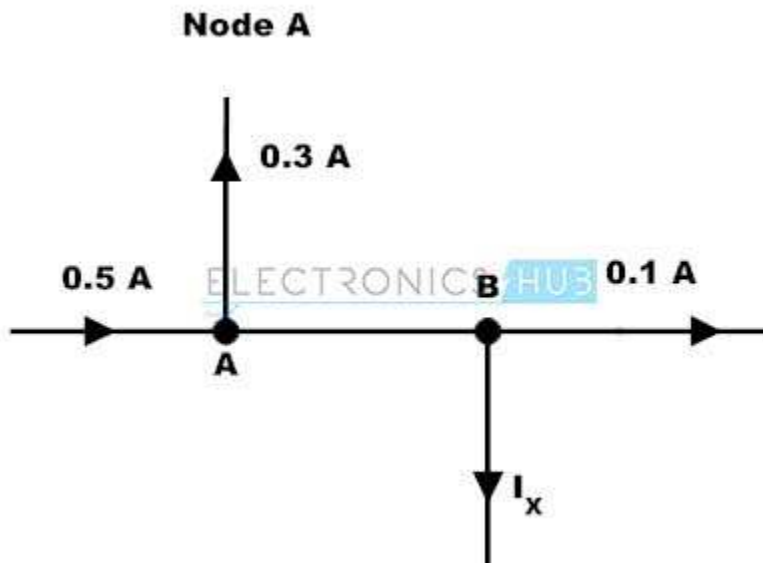


Calculate the following values:

1. Total resistance of the circuit. (4 marks)
2. Amount of power derived from the circuit if a voltage of 24V is applied. (3 marks)

QUESTION FOUR (20 MARKS)

- (a) Distinguish the following:
 - (i) Alternating vs direct current (2 marks)
 - (ii) Loop vs node (use simple diagrammatic symbols to illustrate). (4 marks)
- (b) State the functions of the following electronic components:
 - (i) Fuse
 - (ii) Transformer
 - (iii) Inductor (3 marks)
- (c) With the use of an appropriate wave diagram, discuss the difference between frequency and amplitude as used in electric circuits. (6 marks)
- (d) Consider Node A given below: Calculate the value of I_x . (5 marks)



QUESTION FIVE (20 MARKS)

- (a) (i) State what you understand by a transistor. (2 marks)
- (ii) Using appropriate symbol diagrams, differentiate between a PNP and a NPN transistor (4 marks)
- (b) Provide the main differences between a Bipolar Junction Transistor (BJT) and a Field Effect Transistor (FET). (4 marks)
- (c) Give THREE advantages and three disadvantages of a transistor over a vacuum tube (6 marks)
- (d) Describe the following technologies as used in transistors:
 - (i) PMOS
 - (ii) NMOS (4 marks)