MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

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ELECTRICAL PRINCIPLES 1

INSTRUCTIONS*:* Answer all questions

Question One (COMPULSORY) (30 MARKS)

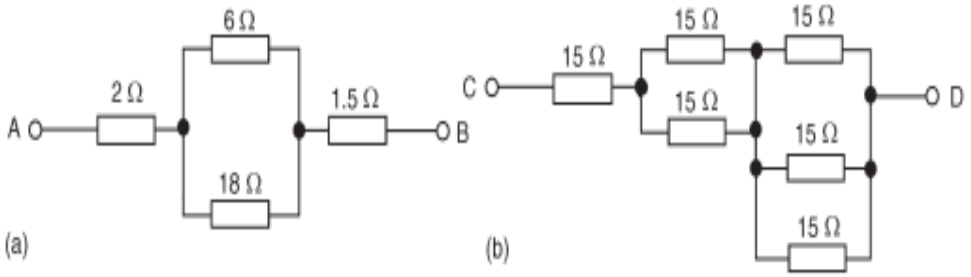
a) Define the following terms

i) Coulomb
ii) Joule
iii) Insulators (6 marks)

b) Determine the values of the following resistors

i) Red Red Red Gold
ii) Yellow Blue Brown Silver
iii) Blue Violet Black no colour (6 marks)

c) In figure a and b below, determine the total resistance between terminals A and B and supply current if 20V supply is connected to both circuits



(8 marks)

QUESTION TWO (20 MARKS)

a) Explain the following terms with reference to cells

i) Electrolysis

ii) Polarization

iii) Local action (6 marks)

i) With the aid o a labeled diagram explain the construction of the leclanche Cell

(4 marks)

ii) State any three advantages of the alkaline cell (3 marks)

b i) 10, 12 V cells with internal resistance of 0.2Ω are connected in series across a load of 60 Ω.

Determine the P.d of the battery (3 marks)

ii) The resistance of aluminum wire at 20^0c is 300 Ω. The temperature is increased and resistance raise to 400Ω. If the specific resistance of aluminum 0.0042/^{0}c at 20^0c. Determine the temperature rise (4 marks)

Question 3.

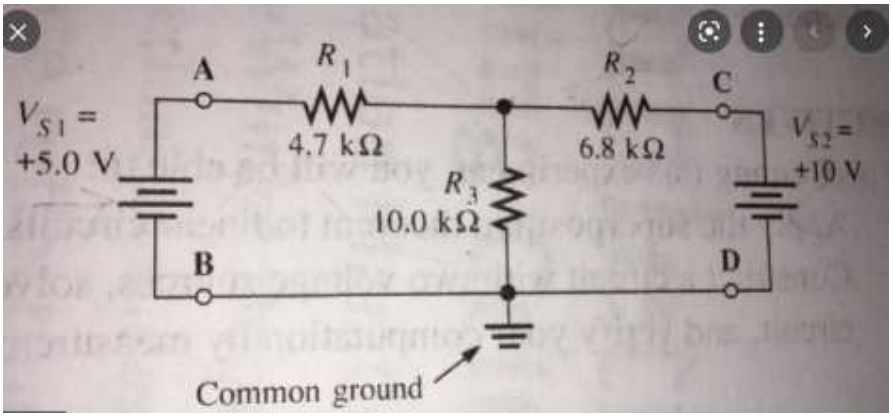
a) i) Explain factors affecting the resistance of a material in electrical

(4 marks)

ii. A current 10A flows in an electric motor the resistance of the winding is 200 Ω, determine the p.d and power dissipated (4 marks)

b) i. State the Kirchhoff's laws (2 marks)

ii. In figure 1, using super position theorem Determine the current through points C and D



(5 marks)

figure 1

a) In figure 2 , Using the Thevenins thereon determine the current through A B (5 marks)

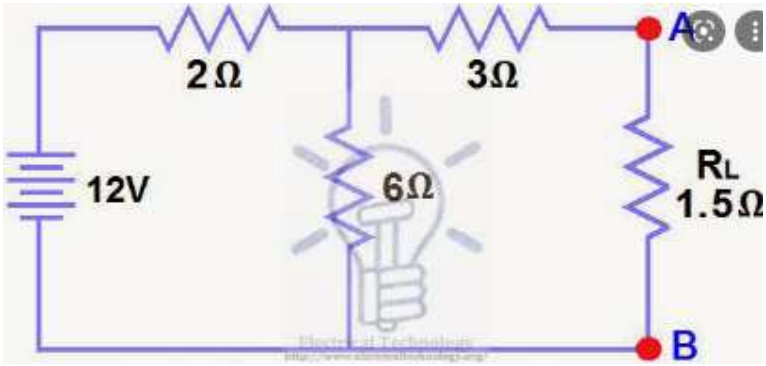


figure 2

QUESTION FOUR (20 MARKS)

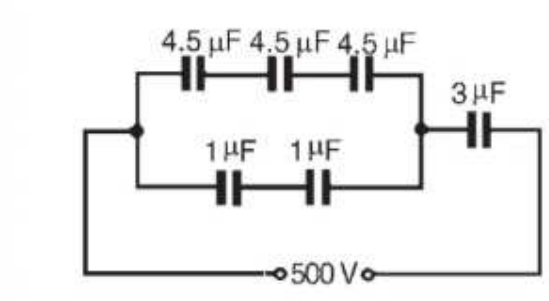
a) i State the coulombs law of electrostatics (2 marks)

ii) Define the terms Electric Field Strength and Electric Flux density (4 marks)

iii) A ceramic capacitors has an effective area of 6 cm^2 Separated by 0.2 mm permittivity of 80. Determine capacitance of capacitors, p.d between the plates if a charge of 2m C flows. (4 marks)

b i) Explain the construction of any Two types of capacitors used in electrical (2 marks)

ii) In figure 6 determine the equivalent capacitance and voltage through 4.5µf capacitors (5 marks)



b) A 6 microfarad capacitors is charged so that the p.d between its plates is 600 V. Determine how long can be discharged to a current of 5milliAmperes

(3 marks)

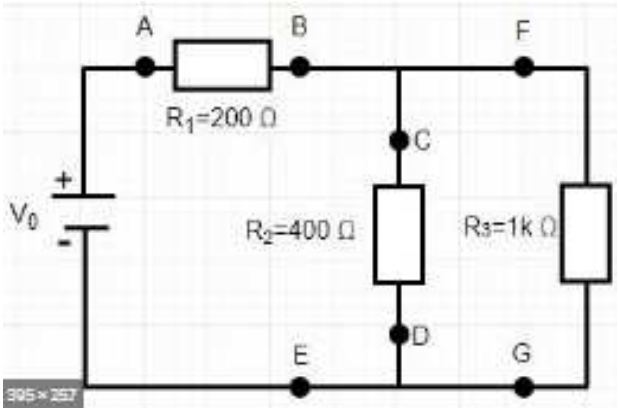
QUESTION FIVE (20 MARKS)

a) i) List any three effects of corrosion (3 marks)

ii) Explain the methods of reducing corrosion and local action (4 marks)

b) List the three types of supplies in electrical (3 marks)

c) i) Using the Kirchhoff's laws determine the value of current through F G; (6 marks)



ii) List any Two characteristics of a desirable conductors and semi conductor (4 marks)