MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN TELECOMMUNICATION ENGINEERING

EED 101: ELECTRICAL ENGINEERING PRINCIPLES 1

DATE: **TIME:**

INSTRUCTIONS

Attempt Question ONE And Any Other Two Questions

1. (a) (i) Two resistors R1 and R2 connected in parallel. Using the current-divider rule write the expressions for current through each resistor.

(ii) Three resistors connected in parallel have a total resistance of 60 Ω. The resistances of two of the resistors are 15 Ω and 20 Ω. If the supply voltage is 240 V and the circuit is operated for 2 minutes. Determine ;

I. The resistance of the third resistor

II. Power developed in the circuit

III. Energy dissipated (8 marks)

(b) (i) State the Kirchhoff's laws

(ii) Figure 1 shows an electrical network .By means of the Kirchhoff's laws calculate the

I. Supply current, I

II. Supply voltage, E.

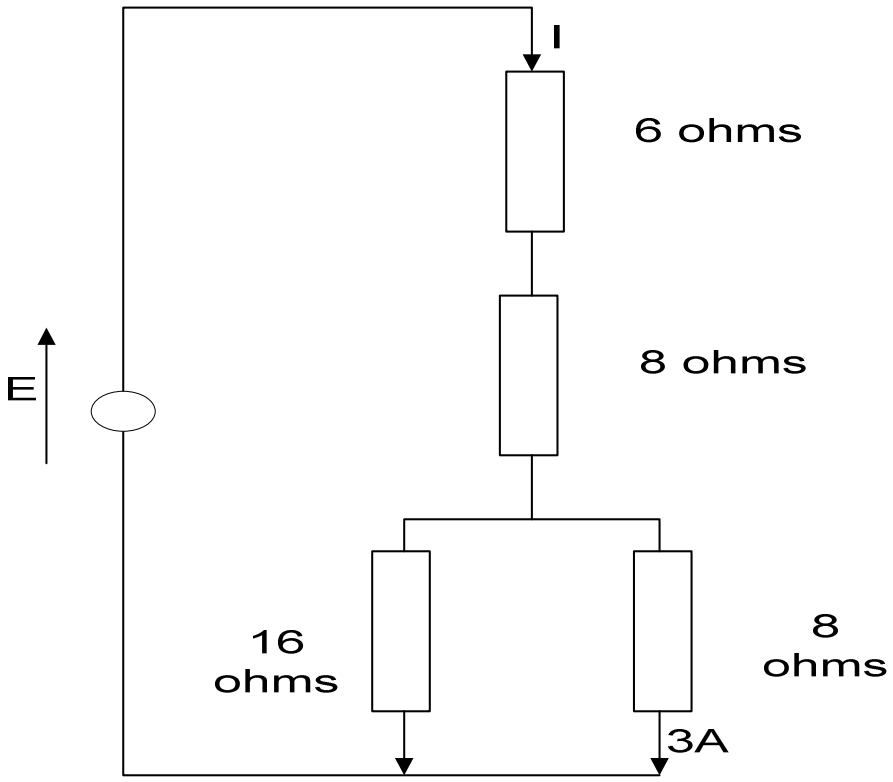

Fig 1 (8 marks)

(c) (i) Describe the principle of operation of a the wireless battery charging

(ii) State four characteristics of lines of magnetic flux. (8 marks)

(d) A circuit consisting of two capacitors 18 μF and32 μF connected in series are supplied by a 12V dc source. Determine for the circuit;

I. total capacitance

II. voltage across each capacitor

II. energy in the 18 μF capacitor (6 marks)

2. (a) (i) Explain the effect of temperature on conduction on semiconductors.

(ii) Explain the term ' temperature coefficient of resistance' (6 marks)

(b) The primary winding of a transformer is connected to a 240 V supply. When the copper winding is 22 ºC, the current is 2 A. After the transformer is operated for some hours, the current fell to 1.8A ,the voltage remaining unaltered. Assuming the temperature coefficient of resistance of copper to be 0.00426/ºC .Determine the temperature the winding after this duration. (5 marks)

(c) (i) a circuit has two resistors 1 KΩ and 2.2 KΩ in parallel connected in series with a 3.3 KΩ resistor. The network is supplied by a 10 V dc source. Determine;

I. total resistance

II. supply current

III. power (6 marks)

(ii) A conductor 100 metres long has a of diameter 0.5mm. If the conductor has a resistance of 300Ω. Determine the resistivity of the conductor material. (3 marks)

3. (a) (i) State Faraday's induction law

(ii) A copper conductor 20 cm long is carrying current of 15 A. If the conductor is placed in a magnetic field with density 0.5 T. Calculate the force on the conductor. (4 marks)

(b) (i) Define the following terms with respect to electrostatics;

I. Dielectric

II. Absolute permittivity

(ii) A capacitor is made of three metal plates separated by a 2 mm thick mica sheet . The area of each plate is 400 cm^2. If mica has relative permittivity of 5 and absolute permittivity is 8.85 X 10^{-12} F/m and a p.d of 110 V is maintained across the terminals of the capacitor. Calculate

(i) capacitance

(ii) charge

(iii) electric field strength

(iv) energy stored (12 marks)

(iii) Describe an experiment to confirm presence of lines of magnetic flux.

(4 marks)

4 . (a) (i) Distinguish between primary and secondary cells

(ii) State four measures when handling lead acid batteries (6 marks)

(b) With an aid of a labeled diagram describe the application of a syringe hydrometer in lead acid battery checks. (6 marks)

(c) A coil of 400 turns is wound uniformly over a wooden ring having a mean circumference of 500mm and a uniform cross-sectional area of 800 mm^2 . If the current through the coil is 2 A and permeability of free space is $4\pi \times 10^{-7}$ H/m. Calculate the;

(i) magnetic field strength

(ii) flux density

(iii) total flux (8 marks)

5. (a) (i) State the superposition theorem

(ii) Figure 2 shows an electrical network .By means of superposition theorem, calculate the currents I_1,I_2 and I_3.

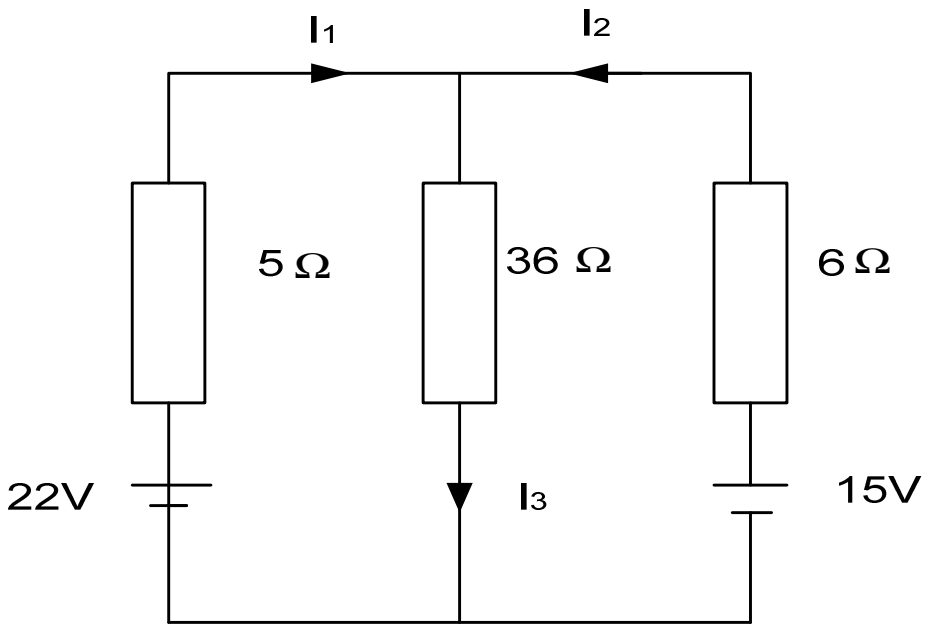

Fig 2 (10 marks)

(b) Draw labeled diagrams of each of the following battery charging systems.

i. Constant voltage

ii. Constant current (10 marks)