

Mt Kenya



University

UNIVERSITY EXAMINATION 2009/2010

SCHOOL OF APPLIED AND SOCIAL SCIENCES

DEPARTMENT OF INFORMATION TECHNOLOGY

EXAMINATION FOR BACHELOR OF BUSINESS INFORMATION TECHNOLOGY

BBIT 1102: BASIC ELECTRICITY & OPTICS

Time: 2Hours

Instructions

Answer question *ONE* and any other *TWO* questions

Question One

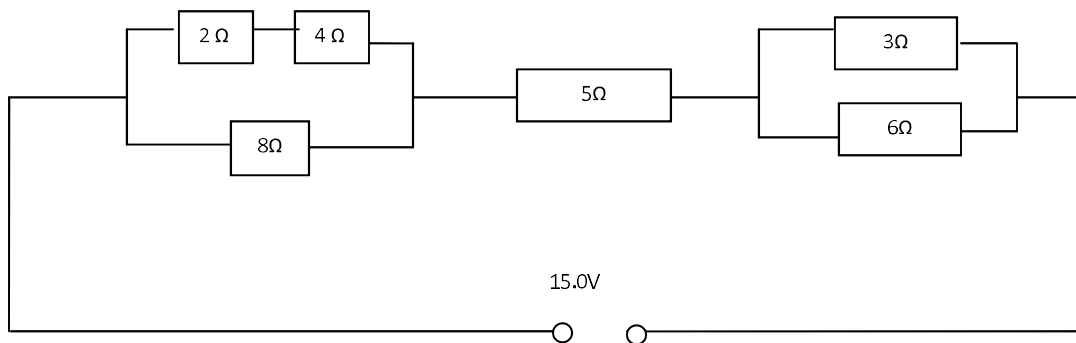
- (a) (i) State Ohm's law (2mks)
- (ii) Define Capacitance (2mks)
- (b) (i) Differentiate between Hard and Soft X-rays (3mks)
- (ii) State the conditions necessary for total internal reflection. (2mks)
- (c) (i) Differentiate between the following
- I. Conductors
 - II. Semi-conductors
 - III. Insulators (3mks)
- (ii) Differentiate between thin and thick lenses (2mks)
- (d) State the factors on which resistance of a conductor depends. (4mks)
- (e) (i) State the factors which affect capacitance of a capacitor. (3mks)
- (ii) State FOUR properties of electromagnetic waves (4mks)
- (f) The frequency of an X-ray radiation used in killing deep cancer growth is 10^{12} Hz. Calculate the wavelength of this radiation. (3mks)

Question Two

- a) i) Define laser (2mks)
ii) Outline four (4) types of lasers (4mks)
iii) Outline four application areas of lasers (4mks)
- b) i) Differentiate between intrinsic and extrinsic semiconductor (2mks)
ii) With the aid of a diagram explain the working principles of a transistor (4mks)
iii) With the aid of a diagram explain how diodes are used to as a rectifier of a.c current and smoothing out the output (4mks)

Question Three

- (a) Define the term resistance as used in electricity. (2mks)
- (b) Calculate the current flowing through a circuit supplied by a 12v battery and connected to a 4Ω resistor. (4mks)
- (c) Show from first principles that the combined resistance R_T for two resistors R_1 and R_2 combined in parallel is given as $R_T = \frac{R_1 R_2}{R_1 + R_2}$ (4mks)
- (d) Resistors are connected in a circuit diagram as shown in Fig 1 below.



Calculate

- (i) Total resistance in the circuit
- (ii) Total current in the circuit
- (iii) Current in the 3Ω resistor
- (iv) Current through 8Ω resistor (10mks)

Question Four

- a) i) With the aid of a diagram outline the working principle of fibre optics (4mks)
- ii) With the aid of a diagram show that the lens equation is given by

$$\frac{1}{Z} = \frac{1}{V} + \frac{1}{u}$$

where Z is the focal length, V the image distance and u the object distance. (8mks)

- b) The figure 2 below shows a combination of capacitors. If $C_1=C_2=C_3=C_4=C_5=30\mu\text{f}$.

Find

- i. Equivalent capacitance
- ii. Voltage drop across C_5
- iii. Energy possessed by C_3
- iv. Charge on C_2

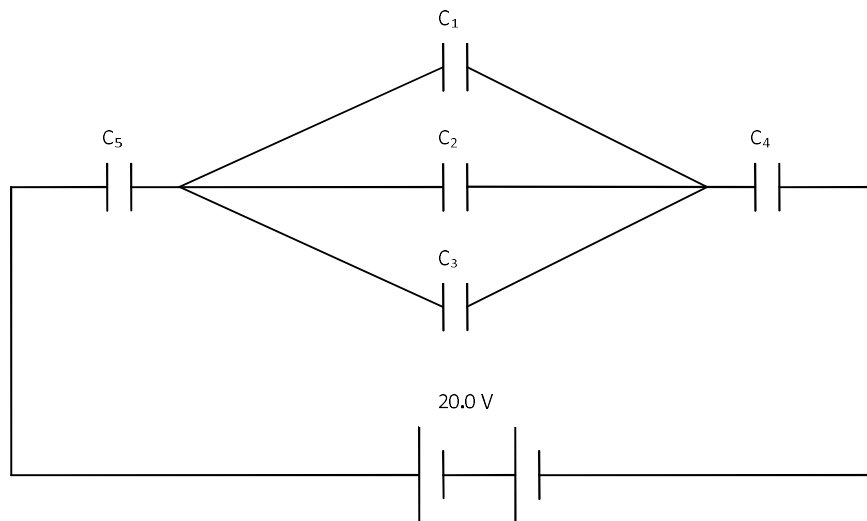


Figure 2

(8mks)

Question Five

- a) i) State Faraday's law
ii) State Lenz's law
iii) Outline mutual inductance (4mks)
- b) Outline three (3) ways in which energy is lost in transformers (6mks)
- c) A transformer is to be used to provide power to a 12V lamp from an a.c mains supply of 315v. Current through the lamp is 5A and efficiency of the transformer is 80%. Find
- i. Find the number of turns of the secondary coil in the primary coil has 1000 turns.
 - ii. Power supplied to the transformer
 - iii. Current in the primary coil

(10mks)