



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

*Faculty of Engineering & Technology*

DEPARTMENT COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION & COMMUNICATION TECHNOLOGY  
(DICT2K11M)

**APS 2102: PHYSICS**

SPECIAL/SUPPLEMENTARY EXAMINATION

**SERIES: FEBRUARY/MARCH 2012**

**TIME: 2 HOURS**

## **Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

## **SECTION A (COMPULSORY)**

### **QUESTION 1**

a) Define the following terms:

- i) Capacitance
- ii) Time constant
- iii) Transmission ratio
- iv) Self inductance
- v) Mutual inductance

**[10 marks]**

b) With the aid of a graph, explain the Ohm's law.

**[3 marks]**

c) Using symbols differentiate between step-up and step-down transformer.

**[2 marks]**

d) State two applications of transformers.

**[2 marks]**

e) Calculate the maximum and the minimum values of the following resistors given the colour codes below:  
(all answers in  $k\Omega$ )

- i) Red, green, yellow
- ii) Blue, black, purple, silver
- iii) Yellow, red, yellow, gold

**[6 Marks]**

## **SECTION B (ANSWER ANY TWO QUESTIONS)**

### **QUESTION 2**

a) Three capacitors of  $30\mu F$ ,  $20\mu F$  and  $400\mu F$  are connected in series and the connected to  $3600\mu F$  capacitor in parallel. The network is then supplied with  $30V$  d.c.

- i) Draw the circuit diagram
- ii) Calculate the total capacitance in the circuit
- iii) Charge across the  $3600\mu F$  capacitor
- iv) Energy in the circuit

**[8 marks]**

b) Define the following terms;

- i) Intrinsic semiconductor
- ii) Extrinsic semiconductor
- iii) Doping

**[6 marks]**

c) With the aid of circuit diagrams explain the following with regard to diodes

- i) Forward biasing
- ii) Reverse biasing

**[6marks]**

d) Define the following terms

- i) Rectification
- ii) Voltage regulation

**[3 marks]**

### **QUESTION 3**

a) Using circuit diagram and wave form diagrams, explain the operation of a full wave bridge rectifier.

- b) State two applications of a half wave rectifier. [8 marks]  
[2 marks]
- c) State the Kirchoff law on
- i) Current
  - ii) Voltage [3 marks]
- d) Three resistors of  $200\text{K}\Omega$ ,  $100\text{K}\Omega$  and  $80\text{K}\Omega$  are connected in parallel they are then connected in series to  $50\text{K}\Omega$  and  $75\text{K}\Omega$  resistors. The network is then supplied with 50v d.c.
- i) Calculate the total resistance of the circuit
  - ii) Voltage drop in the parallel circuit
  - iii) Total current in the circuit
  - iv) Current through 200k, 100k and 80k resistors
  - v) Total power dissipated by the circuit [10 marks]

#### QUESTION 4

- a) Define the following terms:
- i) Depletion layer
  - ii) Base
  - iii) Emitter
  - iv) Collector [4 marks]
- b) With the aid of circuit diagrams explain the three bipolar transistor configurations [6 marks]
- c) Using graph sketches explain the following bipolar transistor characteristics;
- i) input
  - ii) output
  - iii) transfer characteristics [9 marks]
- d) A transistor amplifier circuit is supplied with 12 D.C, the collector resistor is of  $680\Omega$  and the base biasing resistor of  $50\text{K}\Omega$ .If the transistor is made of silicon and has an amplification factor of 50:
- i) Draw the circuit diagram
  - ii) If the input voltage is 1V calculate;  
 $I_b$ ,  $I_c$ ,  $I_e$ ,  $V_c$  and  $V_{out}$  [4 marks]

#### QUESTION 5

- a) Define the following terms;
- i) Resistance
  - ii) Reactance
  - iii) Impedance [6 marks]
- b) Determine the colour codes for the following resistor:
- i)  $1.9\text{M}\Omega \pm 20\%$
  - ii)  $330\text{K}\Omega \pm 10\%$
  - iii)  $470\Omega \pm 5\%$
  - iv)  $4.7\text{M}\Omega \pm 2\%$  [4 marks]

c) i) A capacitor is connected in series to a resistor of  $100\text{k}\Omega$  for charging. It took  $0.05\mu\text{s}$  to charge the capacitor to its time constant. Calculate the value of that capacitor. **[3 Marks]**

ii) A capacitor of  $3600\mu\text{f}$  was charged using  $12\text{Vd.c}$ ,  $20\text{mA}$  supply. Calculate the time taken by the capacitor to be fully charged. **[4 marks]**

d) A transformer with a turns ratio of 8:1 is supplied with  $110\text{V}$ ,  $60\text{Hz}$ . If the secondary current is  $10\text{A}$ .

Calculate:

- i) Primary current
- ii) Secondary voltage
- iii) Input power

**[6 Marks]**