TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN ARCHITECTURE (DARCH 14S)

APS 2102: PHYSICS II

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table*

This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

a) For an inverting amplifier using an OP.AMP R_{in} = 100KΩ and R_f = 500KΩ. Calculate the output voltage if the input voltage is – 2V **(5 marks)**

b) Calculate the output voltage of a non-inverting constant gain multiplier for value of V_{in} = 2V, R_f = 500KΩ and R_{in} = 100KΩ **(5 marks)**

c) What is the output voltage of a OP-AMP summing amplifier for the following sets of input voltages and resistors (R_f = 1MΩ for all cases)

$V_1 = 1V,\ V_2 = +2V, V_3 = +3V, R_1 = 500K\Omega$

$R_2 = 1M\Omega\ \ and\ \ R_3 = 1M\Omega$

(i) **(5 marks)**

$V_1 = -2V,\ V_2 = 3V, V_3 = +1V, R_1 = 200K\Omega$

$R_2 = 500K\Omega\ \ and\ \ R_3 = 1M\Omega$

(ii) **(5 marks)**

Question Two

a) A comparator is a circuit which can compare signals and give an output with aid of an OP-AMP. Show how a comparator can be configured and how it operates **(10 marks)**

b) A non-inverting using an OP-AMP is supplied with a signal 0.08 coswt in the input. The amplifier has an amplification (G) of 100.

(i) Determine the expression of the output of the amplifier **(2 marks)**

(ii) Draw the sketch of the output signal **(2 marks)**

(iii) Determine the value of the External resistors which will give the amplifier the respective gain **(6 marks)**

Question Three

a) Briefly explain the following:

(i) Voltage rectification **(2 marks)**

(ii) Voltage regulation **(2 marks)**

b) Draw the symbols of the following Thyristors:

(i) SCR

(ii) TRIAC

(iii) DIAC **(3 marks)**

c) (I) With the aid of a graph show the characteristics and ratings of an SCR (Silicon controlled Rectifier) **(5 marks)**

(II) Explain the following parameters with regard to the characteristic of SCR

(i) Forward break over voltage **(2 marks)**

(ii) Holding current **(2 marks)**

(iii) Forward blocking region **(2 marks)**

(iv) Reverse break down voltage **(2 marks)**

Question Four

a) State the FIVE ideal properties of operational amplifier **(5 marks)**

b) State the least FIVE application of OP-AMP's **(5 marks)**

c) With the aid of a circuit diagram, show that the gains of inverting and non-inverting amplifiers are given by $G = -R_f / R_2$ and $G = \frac{R_1 + R_f}{R_1}$ respectively **(10 marks)**

Question Five

a) Design an inverting and non-inverting amplifier which will give a gain of -100 and 100 respectively. **(10 marks)**

b) With the aid of two transistor equivalent circuit show the operation of a latch **(5 marks)**

c) State at least FIVE application of SCR's **(5 marks)**