THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY – DICT 10A
(YR 2 SEM 1)

EEE 2120: ANALOGUE ELECTRONICS

END OF SEMESTER EXAMINATIONS

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer booklet*

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
This paper consists of **THREE** printed pages

Question 1 (Compulsory)

a) Outline **FIVE** ideal properties of an Operational Amplifier (5 marks)

b) With the aid of circuit diagrams derive the gains of inverting and non-inverting amplifiers using Operational Amplifier (10 marks)

c) Calculate the output voltage of a summing amplifier, for the following sets of input voltages and resistors (R_f = 0.1M Ω in all cases)

i) VI = +1V, V2 = +2V, V3 = +3V
R1 = 50K Ω, R_2 = 0.1M Ω, R3 =0.1M Ω

ii) VI = -2V, V2 = +3V, V3 = +3V
R1= 20K Ω, R2 = 50K Ω, R3 = 0.1M Ω (10 marks)

d) Derive from the first principles the equation of the output voltage of differentiator and integrator using OP –AMP (5 marks)

Question 2

a) With the aid of a diagram show how a Zener diode can be used to provide reference voltage to the output load. (4 marks)

b) State any **FOUR** advantages and **FOUR** disadvantages of using Zener diode as a voltage regulator (8 marks)

c) Explain any **FOUR** applications of thyristors (8 marks)

Question 3

a) With the aid of PNP and NPN transistors show how a latch can be formed. (4 marks)

b) A Zener diode connected as a voltage regulator; has V_Z = 12V and I_{ZM} = 30mA, is used to supply a variable load. A current limiting resistor of 1 K Ω is connected in series to the diode a fixed D.C voltage of 40V is used to supply the regulator.

(i) Draw the circuit diagram of the regulator
(ii) Determine the range of R_L and I_L that will result in V_L being maintained at 12_V.
(iii) Sketch the graphs of V_L verses R_L and V_L verses I_L
(iv) Determine the maximum wattage rating of the diode as a regulator (16 marks)

Question 4

a) Describe **THREE** methods of triggering ON thyristors (6 marks)

b) With the aid of symbolic diagrams, briefly explain the operations of the following thyristors: SCR, DIAC and TRIAC (14 marks)

Question 5

a) With the aid of a graph describe the following parameters of the silicon controlled rectifier (SCR)
   i) Forward breakover voltage
   ii) Holding current
   iii) Forward and reverse blocking regions
   iv) Reverse breakdown voltage (12 marks)

b) Explain the following terms:
   i) Doping
   ii) Intrinsic semiconductor
   iii) Extrinsic semiconductor
   iv) P-type and N-type semiconductors (8 marks)