THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Faculty of Engineering & Technology

DEPARTMENT COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY - DICT 2K11M

EEE 2120: ELECTRONICS

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 **THREE** printed pages

SECTION A (COMPULSORY)

QUESTION 1 (30 MARKS)

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 =0.1MΩ in all cases)

i) V1=+1V, V2=+2V, V3=+3V
R1=50KΩ, R2=0.1MΩ, R3=0.1MΩ

ii) V1= -2V, V2= +3V, V3= +3V
R1= 20KΩ, R2= 50KΩ, R3= 0.1MΩ (10 marks)

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

SECTION B (Answer any two questions)

QUESTION 2 (20 MARKS)

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 (20 MARKS)

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 1KΩ 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 12V.
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 (20 MARKS)

a) Describe three methods of triggering ON thyristors. (6 marks)

7

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

QUESTION 5 (20 MARKS)

a) With the aid of a graph describe the following parameters of the silicon controlled rectifier (SCR)

i. forward break over 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)