TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MATHEMATICS & COMPUTER SCIENCE

APS 4112: ELECTRONICS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2014

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Mathematical tables*
- *Scientific Calculator*

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 **FOUR** printed pages

Question One (Compulsory)

a) Define the following terms:

(i) Doping **(1 mark)**

(ii) A hole **(1 mark)**

(iii) n-type and p-type semiconductor **(2 marks)**

(iv) Intrinsic semi-conductor **(1marks)**

b) Explain why the conductivity of a metallic conductor decreases with increasing temperature while that of a semiconductor increases with increasing temperature. **(3 marks)**

c) A crystal diode having internal resistance of = 30 Ω is used for half wave rectification. If the applied voltage is 54V and load resistance RL = 770 Ω, find:

- **(i)** Im **(2 marks)**
- **(ii)** Idc **(2 marks)**
- **(iii)** Ir.m.s **(2 marks)**
- **(iv)** ac power input and dc power output **(4 marks)**
- **(v)** d.c. output voltage **(2 marks)**
- **(vi)** efficiency of the rectification **(2 marks)**

d) Explain briefly SIX types of diodes. **(6 marks)**

e) In a common base connection current amplification factor is 0.9. If the emitter current is 1mA, determine the base current. **(2 marks)**

Question Two

a) Explain what happens to the depletion layer when a diode is.
   (i) Forward biased **(2 marks)**
   (ii) Reverse biased **(2 marks)**

b) State THREE ways in which a transistor can be connected in a circuit. **(3 marks)**

c) The collector leakage current in a transistor is 400 μA in common emitter arrangement. If the transistor is now connected in CB arrangement, what will be leakage current? Given that β = 100 **(4 marks)**

d) For a certain transistor, $I_B = 30\mu A,\ Ic = 3mA$ and β = 60. Calculate I_{CBO} **(4 marks)**

e) Name the current carriers in a:
   (i) pnp transistor **(1 mark)**
   (ii) npn transistor **(1 mark)**

f) (i) What is transistor biasing **(2 marks)**

   (ii) What is the importance of biasing **(1 mark)**

Question Three

a) State THREE methods of transistor biasing. **(3 marks)**

b) For the circuit shown below, find the operating point given that β =80. Neglect VBE. **(7 marks)**

c) Find the operating point in the circuit shown in the circuit below. Assume β =80 and VBE = 0.7V **(6 marks)**

d) What will result if biasing is not done in an amplifier circuit? **(2 marks)**

e) What biasing method provides the best stabilization of operating point? Explain? **(2 marks)**

Question Four

a) Draw a well labeled circuit of a transistor amplifier **(5 marks)**

b) In the transistor amplifier circuit shown below if $R_C = 20K\Omega,\ R_L = 20K\Omega,\ Rin = 2k\Omega,\ \beta = 100$ find the output voltage for an input voltage of 1mV r.m.s **(7 marks)**

c) State and explain FOUR factors used in the classification of transistor amplifiers **(8 marks)**

Question Five

a) Define the following terms:
   (i) Filter circuit
   (ii) Operating point **(2 marks)**

b) A microphone delivers 72mV at 600 Ω into an amplifier which deliver 20 walts into a 16 – ohm speaker system at full power. Find the decibel gain of the amplifier. **(5 marks)**

c) A single stage amplifier has a gain of 80. The collector load Rc = 2KΩ and the input impendence is 400Ω. Calculate the overall gain when two such stages are cascaded through R.C coupling.

(5 marks)

d) In a certain transistor power amplifier, $i_{c\max} = 200mA$ $ic(\min) = 20mA$, $V_{CE(\max)} = 12V$ and $V_{CE(\min)} = 3V$

. Calculate the a.c. output power. **(5 marks)**

e) The voltage gain of an amplifier without feedback is 4000. Calculate the voltage gain of the amplifier if negative feedback is introduced in the circuit, given that feedback fraction m = 0.0.2

(3 marks)