TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN MARINE ENGINEERING (DMAE 4)

EMR 2215
MARINE ELECTRONICS

END OF SEMESTER EXAMINATIONS

YEAR 2 SEMESTER 2

SERIES: DECEMBER, 2013

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. You should have the following for this examination:
   - Answer Booklet

2. This paper consists of **FIVE** Questions.
3. Answer **ANY THREE** Questions.
4. All Questions carry Equal marks.
4. **This paper consists of *THREE* printed pages.**

Question ONE

(a) State the **THREE** main reasons why modern digital systems use integrated circuits. **(6 marks)**

(b) (i) Give **TWO** types of logic families. **(2 marks)**
(ii) Describe the characteristics of the **TWO** logic families stated in b(i) above. **(8 marks)**

(c) State any **FOUR** advantages of integrated circuits. **(4 marks)**

Question TWO

(a) Define the following terms:

(i) Intrinsic semi-conductor
(ii) Extrinsic semi-conductor

(4 marks)

(b) Outline the important points that should be considered when carrying out the doping processing semiconductor technology. **(4 marks)**

(c) With the aid of a diagram, briefly explain how the following two types of extrinsic semi-conductors are made by employing the doping process:

(i) N-type semi-conductor
(ii) P-type semi-conductor

(12 marks)

Question THREE

(a) (i) Define the term operational amplifier (Op Amp). **(2 marks)**

(ii) State any **FIVE** applications of Operational Amplifiers. **(5 marks)**

(b) For the Figure 1 below, the parameters of an inverting configuration of an operational amplifier are given as follows:

$V_{in} = 0.6V$: $R_F = 20k\Omega$
$R_1 = 2k\Omega$: $A_{oL} = 400k$
$R_{in} = 8M\Omega$: $R_o = 60\Omega$

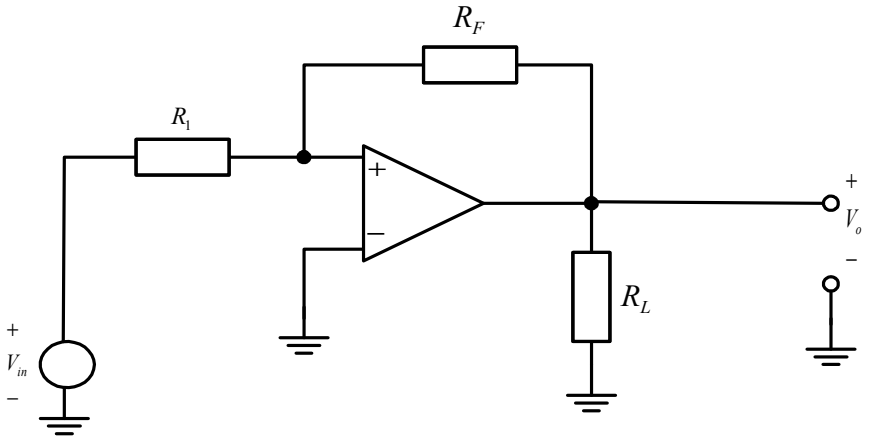

Fig. 1

Calculate:

(i) Output voltage, V_o

(ii) The feedback current, I_F

(iii) Voltage gain, A_v

(iv) β

(v) $R_{in\,F}$ and

(vi) R_{oF}

(11 marks)

Question FOUR

(a) Differentiate between amplitude modulation and frequency modulation. **(4 marks)**

(b) An oil tanker has an antenna height of 16 feet above the ship's upper deck. Determine the range of a marine VHF radio that is installed onboard the ship. **(3 marks)**

(c) With the aid of a block diagram, explain the working principle of an AM Transmitter, showing its input and output waveforms. **(13 marks)**

Question FIVE

(a) (i) Define the term "Photoelectric effect" **(1 mark)**

(ii) Give **THREE** examples of photoelectric devices. **(3 marks)**

(b) Describe the following processes; giving examples in each case:

(i) Photo conductivity

(ii) Photo emission

(10 marks)

(c) Sketch a photovoltaic cell and correctly label it. **(6 marks)**