



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING**

EEE 309: ANALOGUE ELECTRONICS 2

DATE: TUESDAY, 17TH APRIL 2012

TIME: 2.00 P.M. – 4.00 P.M.

IMPORTANT: Instructions to Candidates:

1. The paper has five questions. Answer Question one which is compulsory, and any other two questions.
2. You should interpret the questions in the context of the course material.

Question One (30 marks) Compulsory

- a. Explain the meaning of the following terms
 - i. Common mode rejection ratio (2 marks)
 - ii. Slew rate (2 marks)
 - iii. Op amp feedback (2 marks)
- b. A 50 KHZ signal is to be amplified in an op amp to give an output of 10 V. what is the slew rate of the amplifier? (4 marks)
- c. Derive the gain formula of:
 - i. Inverting operation amplifier
 - ii. Non inverting operation amplifier (8 marks)
- d. What is op amp stability? Discuss any three compensation techniques (8 marks)
- e. An OPAMP has a slew rate of 5 V/ μ S. Calculate largest sine wave O/P voltage possible at a frequency of 1MHZ. (4marks)

Question two

- a. State and explain any five characteristics of an ideal op amp (10 marks)

- b. Using the relevant equations, draw diagrams of:
 1. An integrator
 2. A differentiator
- c. Discuss the functionality of above circuits

(10 marks)

Question three

- a.
 1. Name any two areas where an instrumentation amplifier finds application.
 2. What is the relevance of instrumentation amplifier in these areas?
- b. Derive the gain equation for a non inverting op amp
- c. Calculate the common mode gain of an op amp given that it has a differential gain of 30000 and a CMRR of 90 Decibels.
- d. Discuss the following
 1. Virtual ground
 2. Input offset current
 3. Differential amplifier
 4. Op amp feedback

(4 marks)

(4 marks)

(4 marks)

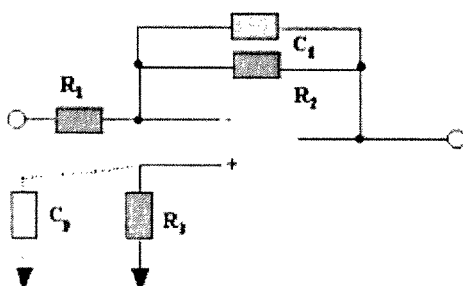
(8 marks)

Question four

- a. What is the approximate input impedance of the OPAMP circuit which has $R_i=10k$, $R_f=100k$, $R_L=10k$
- b. An OPAMP has a slew rate of $7 V/\mu S$. Calculate largest sine wave O/P voltage possible at a frequency of 2MHZ.
- c. Determine the output voltage when $V_1 = -V_2 = 1 V$.

(4 marks)

(4 marks)



$$R_1 = 100 \text{ k}\Omega, R_2 = 100 \text{ k}\Omega, R_3 = 20 \text{ k}\Omega,$$

(4 marks)

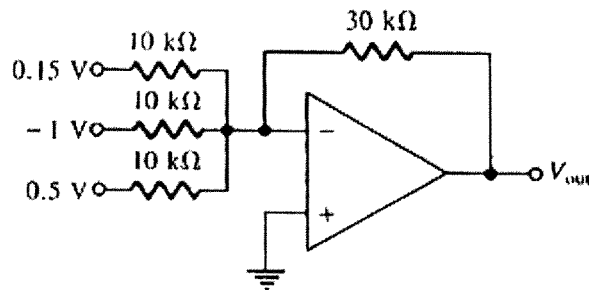
- d. If the value of resistor R_f in an averaging amplifier circuit is equal to the value of one input resistor divided by the number of inputs, what value is realized at the output? Discuss
- e. Discuss the differential amplifier. Write the relevant equations and its diagram

(4 marks)

(4 marks)

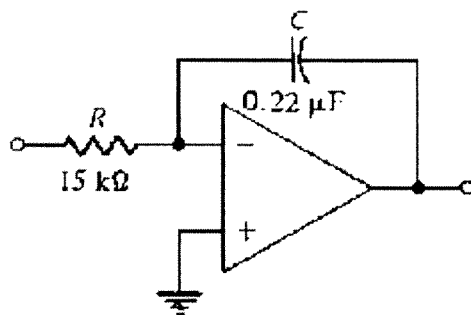
Question five

- What is the difference between single-ended output and balanced output of an op amp?
(4 marks)
- Refer to the given figure. Determine the output voltage, V_{OUT} .
(4 marks)



(4 marks)

- If an op-amp comparator has a gain of 100,000, an input difference of 0.2 mV above reference, and a supply of ± 12 V, what is the output voltage
(4 marks)
- Refer to the given figure below. If $V_{in} = 5$ V, what is the rate of change of the output voltage in response to a single pulse input
(4 marks)



(4 marks)

- Referring to the given figure, determine the lower trigger point.
(4 marks)

(4 marks)

