

UGANDA MARTYRS UNIVERSITY

FORT PORTAL CAMPUS

FACULTY OF ENGINEERING AND APPLIED SCIENCES

DEPARTMENT OF ELECTRICAL ENGINEERING

END OF SEMESTER I YEAR II ACADEMIC YEAR 2023/2024 EXAMINATIONS
DECEMBER, 2023

PROGRAMME (S) **DIPLOMA IN ELECTRICAL ENGINEERING**

COURSE NAME: **AMPLIFIER CIRCUITS**

COURSE CODE: **BEE2104**

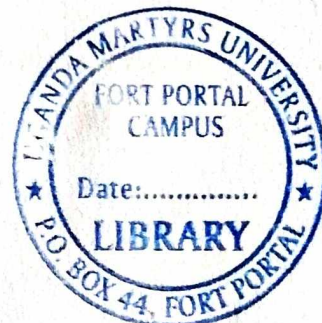
DATE: 9th DECEMBER, 2023

TIME: 9:00AM -12:00PM

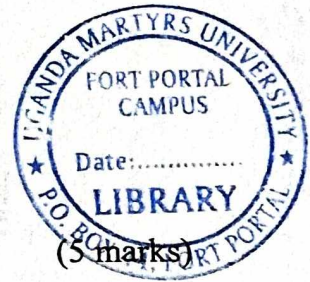
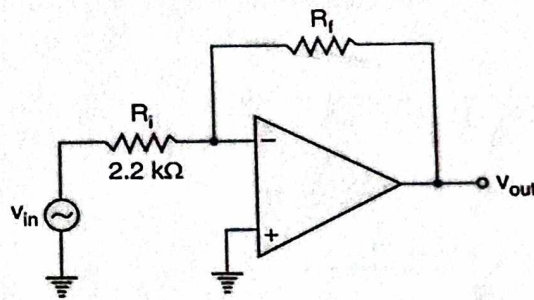
Instructions:

- This paper consists of **six (6)** questions.
- Attempt **any four (4)** questions.
- All questions carry equal marks.

1. (a) The voltage gain of an amplifier without feedback is 3000. Calculate the voltage gain of the amplifier if negative voltage feedback is introduced in the circuit. Given that feedback $\beta = 0.01$. (5 marks)
- (b) The overall gain of a multistage amplifier is 140. When negative voltage feedback is applied, the gain is reduced to 17.5. Find the fraction of the output that is feedback to the input. (7.5 marks)
- (c) When negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls to 50.
- (i) Calculate the fraction of the output voltage feedback. (5 marks)
- (ii) If this fraction is maintained, calculate the value of the amplifier gain required if the overall stage gain is to be 75. (7.5 marks)
2. (a) With a negative voltage feedback, an amplifier gives an output of 10 V with an input of 0.5 V. When feedback is removed, it requires 0.25 V input for the same output. Calculate:
- (i) The gain without feedback (5 marks)
- (ii) The feedback fraction, β (7.5 marks)



- (b) (i) Given the operational amplifier configuration below, determine the value of R_f required to produce a closed-loop voltage gain of -100 .



- (c) Two voltages of $+0.6\text{V}$ and -1.4V are applied to the two input resistors of a summing amplifier. The respective input resistors are $400\text{ k}\Omega$ and $100\text{ k}\Omega$ and feedback resistor is $200\text{ k}\Omega$. Determine the output voltage. (7.5 marks)

3. (a) An amplifier produces an output voltage of 2 V for an input of 50 mV . If the input and output currents in this condition are, respectively, 4 mA and 200 mA , determine:

- (i) the voltage gain; (5 marks)
- (ii) the current gain; (5 marks)
- (iii) the power gain. (5 marks)

(b) Write short notes on the following amplifier classes.

- (i) Class A (5 marks)
- (ii) Class B (5 marks)

4. (a) Using bipolar junction transistors, give three amplifier connections with illustrations. (5 marks)

(b) The gain of an amplifier without feedback is 100 whereas with negative voltage feedback, it falls to 25 . If due to ageing, the amplifier gain falls to 20 , find the percentage reduction in stage gain

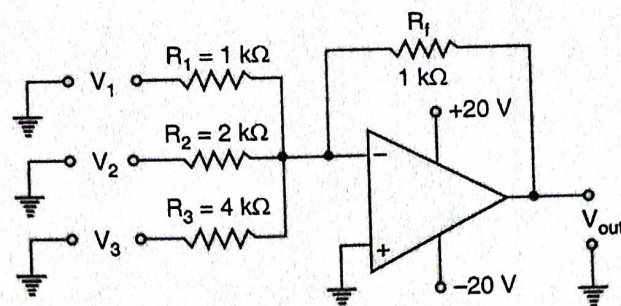
- (i) Without feedback (5 marks)
- (ii) With negative feedback. (5 marks)

(c) An amplifier has a voltage gain of 300 without feedback. If a negative feedback is applied, the gain is reduced to 80 . Calculate the fraction of the output fed back. If, due to ageing of components, the gain without feedback falls by 10% , calculate the percentage fall in gain with feedback. (10 marks)

5. (a) (i) What is an operational amplifier? (2 marks)
- (ii) List eight characteristics of an ideal operational amplifier. (8 marks)

(b) Determine the output voltage from the circuit below for each of the following input combinations:

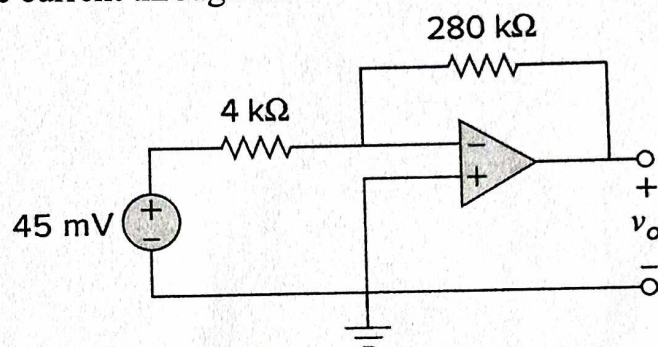
$V_1(V)$	$V_2(V)$	$V_3(V)$
+ 10	0	+10
0	+10	+10
+10	+10	+10



(15 marks)

6. (a) (i) Find the output of the operational amplifier circuit below.
(ii) Calculate the current through the feedback resistor.

(5 marks)

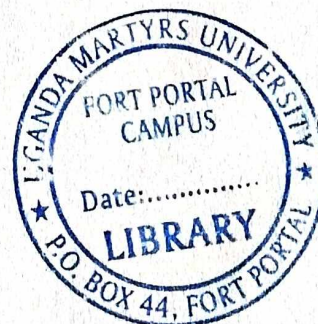


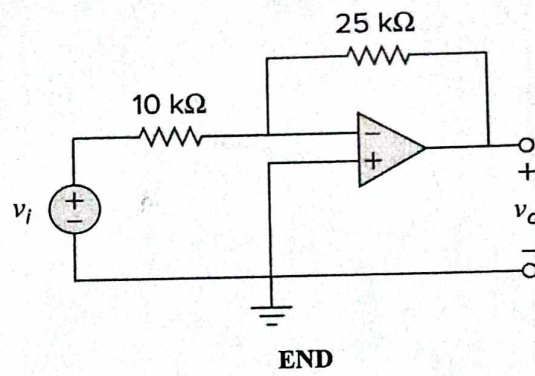
(7.5 marks)

(b) Refer to the operational amplifier below. If $V_i = 0.5 V$, calculate:

(5 marks)

- (i) The output voltage V_o
(b) The current in the $10 k\Omega$ resistor.





(7.5 marks)

