Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: EC204

Course Name: ANALOG INTEGRATED CIRCUITS (AE, EC)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Derive the equation for closed loop voltage gain, input resistance with feedback, output resistance with feedback and total output offset voltage with feedback of a voltage series feedback amplifier. (10)

b) Define slew rate. What are its causes? Derive the equation for maximum input frequency at which an undistorted signal is obtained in terms of slew rate? (5)

2 a) Design an inverting adder circuit using opamp to get the output expression as V_0=--(0.2V1+2V2+20 V3) , where V1, V2 and V3 are the inputs. (7)

b) Derive the equation for the output voltage for an averaging circuit using opamp. (8)

3 a) Draw the equivalent circuit of an operational amplifier. Explain voltage transfer characteristics of an operational amplifier. (8)

b) Define a)Power Supply Rejection Ratio b) Input Offset Current (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Explain the working of full wave precision rectifier. (9)

b) Derive the equation for output voltage of an integrator. Why is it called a lossy integrator? (6)

5 a) Explain how switching takes place at UTP and LTP in a Schmitt trigger. Plot the hysteresis curve. (10)

b) What is a zero crossing detector? (5)

6 a) Design a first order low pass filter at a cut-off frequency of 2kHz with a pass band gain of 3 (8)

b) Prove that the input voltage is converted into corresponding output current in a voltage to current converter with floating load. (7)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Explain the operation of Phase Locked Loop. What is lock range and capture range?	(10)
	b)	With the help of internal diagram explain the monostable operation of timer IC 555. Draw the input and different output waveforms. Derive the equation for pulse width.	(10)
8	a)	Explain the working of successive approximation ADC	(10)
	b)	Discuss the operation of dual slope ADC	(10)
9	a)	What is a sample and hold circuit	(5)
	b)	Discuss how digital signal is converted into analog signal in a weighted resistor DAC.	(6)
	c)	Explain the internal diagram of I.C. 723	(6)
	d)	Explain how current boosting is achieved using I.C 723	(3)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EC204

Course Name: ANALOG INTEGRATED CIRCUITS (AE, EC)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration. (8)

b) Define the following: (3)
i)Input bias current ii)Input offset current iii) Input offset voltage

c) Implement the equation using two op-amps (4)
$V_0 = -5V_1 + 2V^2 - 10V3$

2 a) Derive the following characteristics of voltage shunt amplifier: (8)
i) Closed loop voltage gain ii)Input resistance
iii) Output resistance iv)Bandwidth

b) What is slew rate? Derive an equation for it. (4)

c) A differential amplifier has a common mode gain of 0.05 and difference mode gain of 1000.Calculate the output voltage for two signals V1 = 1mV and V2 = 0.9mV (3)

3 a) Explain the variation of differential gain of a differential amplifier with frequency of operation with relevant expressions. (5)

b) Draw the circuit diagram of a differential instrumentation amplifier with a transducer bridge and show that the output voltage is proportional to the change in resistance. (7)

c) How a constant current bias circuit can be used to improve the CMRR of a differential amplifier? (3)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Draw the circuit of a temperature compensated logarithmic amplifier and show that it provides temperature independent logarithmic output. (8)

b) Explain the working of a triangular waveform generator with a neat circuit diagram. Also derive an expression for frequency of oscillation. (7)

5 a) Draw the circuit of a Wien Bridge oscillator using op-amp and derive an equation for frequency of oscillation. (7)

b) With a neat circuit diagram explain the working of astable multivibrator using op-amp. Also derive an expression for time period. (8)

6 a) Draw the circuit of second order low pass filter and derive its transfer function. (8)

b) Draw the circuit of a precision full-wave rectifier and explain its working. (7)

PART C

Answer any two full questions, each carries 20 marks.

7	a)	Explain how a monostable multivibrator can be implemented with 555 IC with relevant waveforms and functional diagram. Derive an expression for pulse width.	(10)
	b)	With a neat circuit diagram, explain the operation of a 3-bit flash converter.	(10)
8	a)	With a neat block diagram explain the working of PLL. Explain any two applications of PLL.	(10)
	b)	Explain the working of dual-slope ADC with a neat circuit diagram.	(10)
9	a)	Explain how short circuit, fold back protection and current boosting are done using IC723 voltage regulator.	(10)
	b)	With a neat circuit diagram explain the working of a weighted resistor D/A converter	(10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

Course Code: EC204

Course Name: ANALOG INTEGRATED CIRCUITS (AE, EC)

Max. Marks: 100 Duration: 3 Hours

PART A

Question No.1 is compulsory. Answer question 2 or 3

1	a)	Draw the block diagram of an op-amp and explain the necessity and implementation of each block.	(10)
	b)	Design an op-amp based circuit to implement the function, Vo = 2Va + 3Vb.	(5)
2	a)	With suitable diagram explain how the voltage series feedback is implemented in op-amp based circuits.	(5)
	b)	Derive the expressions for gain, input impedance, output impedance and frequency response of the above configuration.	(10)

OR

3	a)	Draw and explain the circuit diagram of an instrumentation amplifier and derive the output equation.	(10)
	b)	With suitable diagram and equation, explain how the average of signals can be achieved by using an op-amp circuit.	(5)

PART B

Question No.4 is compulsory. Answer question 5 or 6

4	a)	Design an op-amp based astable multi-vibrator for a duty cycle of 75% and draw the waveforms at different points.	(8)
	b)	Draw and explain the circuit diagram of a log amplifier and derive the output equation.	(7)
5	a)	Draw and explain the working of a practical differentiator circuit including frequency response analysis.	(15)

OR

6	a)	Design a Schmitt trigger circuit for different UTP and LTP magnitudes.	(7)
	b)	Draw and explain the circuit of a square/saw tooth wave generator using op-amps.	(8)

PART C

Question No.7 is compulsory. Answer question 8 or 9

7	a)	List the features of IC555 and design a monostable multi-vibrator for a pulse duration of 1ms using IC555.	(10)
	b)	With suitable diagram explain the working of a flash convertor.	(10)
8	a)	Draw and explain the working of a PLL and describe the importance of lock range and capture range.	(10)
	b)	Explain the method of current boosting in voltage regulator IC's.	(10)

OR

9	a)	Draw and explain the working of a binary ladder type D/A convertor.	(10)
	b)	List and explain at least five important specifications of D/A and A/D convertors.	(10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2017

Course Code**: EC204**

Course Name**: ANALOG INTEGRATED CIRCUITS (AE, EC)**

Max. Marks:100 Duration: 3 Hours

PART A

Question No.1 is compulsory. Answer question 2 or 3

1. a. Define the following terms (6)
   - i) CMRR
   - ii) Slew rate
   - iii) PSRR

   b. Design a circuit to obtain an output voltage of $-(V_1 + 2V_2 + 5V_3)$ (5)

   c. Derive the following characteristics of voltage series feedback amplifier. (4)
   - i) Closed loop gain
   - ii) Input impedance
   - iii) Output impedance
   - iv) Bandwidth

2. a. Explain in detail a method of improving CMRR of differential amplifier. (10)

   b. Explain the various stages of op-amp. (5)

OR

3. Draw an instrumentation amplifier using four op-amps and explain the need for each op-amp. Derive the expression for its output voltage. (15)

PART B

Question No.4 is compulsory. Answer question 5 or 6.

4. a. Explain the working of precision full wave rectifier with a neat diagram. (7)

   b. Draw a second order active high pass filter and derive the expression for its cut off frequency. (8)

5. a. With the help of a neat diagram, derive the frequency of oscillation for RC phase shift oscillator. (10)

   b. Draw the circuit of antilog amplifier and derive the output voltage. (5)

OR

6. a. Explain in detail the working of Schmitt trigger and explain the transfer characteristics. (8)

   b. Design a first order low pass filter with a cut off frequency of 2kHz. (7)

PART C

Question No.7 is compulsory. Answer question 8 or 9.

7. a. Discuss in detail any two applications of PLL. (5)

   b. Write a short note on IC723 based voltage regulators (5)

   c. Explain the working of dual slope A/D converters. (10)

8. a. Explain in detail the working of monostable and astable multivibrator using 555. (10)

   b. Discuss different methods for implementing analog multipliers. (5)

   c. Explain the working of high speed sample and hold switch. (5)

OR

9. a. Derive the output voltage for a 4 bit R-2R ladder D/A converters (10)

   b. Explain the working of successive approximation type A/D converters. (7)

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