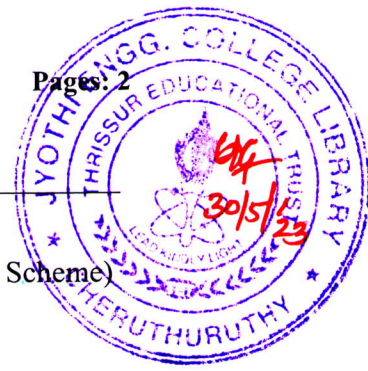


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S2 (PT) (S, FE) Examination May 2023 (2015 Scheme)

**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) Define the term CMRR and derive an expression of a differential amplifier configuration using hybrid π model. (10)
- b) How a constant current source can be used to improve the CMRR of a differential amplifier? (5)
- 2 a) Draw and explain a high gain, low noise amplifier circuit using 3 op-amps for amplifying weak signals for bio-medical applications. Derive the expression for its gain. (8)
- b) What is slew rate? Derive an equation for it. (4)
- c) Draw the equivalent circuit of a practical Op-amp (3)
- 3 a) Derive the expression for the closed loop voltage gain, input resistance and output resistance for an op. amp. with voltage series feed back with circuit diagram (8)
- b) Draw the block schematic of an operational amplifier and explain the functions of each block. (4)
- c) Design a circuit to get $V_0 = (-5)V_1 + 3V_2$ using a single op-amp, where V_1 and V_2 are the input voltages (3)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) Design a Schmitt Trigger Circuit using op-amp with $UTP = 5$ V and $LTP = -2$ V with output saturation voltages at ± 14 V. Draw its voltage transfer characteristics. What is the noise voltage tolerance value of the circuit? (8)
- b) With a circuit diagram and necessary waveforms explain the working of a full wave precision rectifier? Why it is known as precision rectifiers? (7)
- 5 a) Draw a circuit using Op-amp for generating a square wave of 50% duty cycle. (8)

Discuss the principle of operation with necessary waveforms and also Derive the expression for its output frequency.

- b) Draw an appropriate circuit for a low voltage DC voltmeter using opamp and explain its working. (3)
- c) Design an op-amp differentiator that will differentiate an input signal with $F_{max}=200\text{Hz}$ (4)
- 6 a) Draw the circuit of a Wien bridge oscillator using op-amp. Explain its operation. (8)
Derive an expression for the frequency of oscillation for the circuit
- b) Design a second order low pass Butterworth active filter for a cut off frequency of 1 KHz and Draw its frequency response (7)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Draw and explain the functional block diagram of the IC723 and Explain how short circuit and fold back protection is achieved for the above IC with required circuit (12)
- b) What is the principle of operation of Dual slope ADC (8)
- 8 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) The digital input for a 4 bit DAC is 0110, whose output range is from 0 to 10 V. (5)
Calculate the output voltage
- c) Explain the basic operation of three terminal fixed positive and negative voltage regulators with examples (5)
- 9 a) Explain the working principle of R-2R ladder type DAC with circuit. (10)
- b) An 8 bit A/D converter is used for converting 0 to 10V input voltage. (5)
Determine (i) the input voltage required to change by 1LSB (ii) the digital output for an input voltage of 4.8 V
- c) Draw the circuit of an analog multiplier and explain its principle of operation (5)
