Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

FOURTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

**Course Code: EC204**

**Course Name: ANALOG INTEGRATED CIRCUITS**

Max. Marks: 100 Duration: 3 Hours

**PART A**

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

1 a) With the help of a circuit diagram explain the working of a differential amplifier if the following inputs are applied (i) $V_{b1}$=0V, $V_{b2}$=1V (ii) $Vb_1$=1V, $Vb_2$=1V (iii) $Vb_1$= -1V, $Vb_2$=1V (4)

b) List out the ideal characteristics of an op.amp. (3)

c) Design the circuits to obtain the following output, $V_o$. (i) $V_o$= ($5V_1$) (ii) $V_o$= $V_1$+ $2V_2$ (iii)$Vo = -\frac{V1+V2+V3}{3}$ (iv) Vo= - $2V_1$- $5V_2$ (8)

2 a) For a differential amplifier, find the value of $v_{id}$ to cause $i_{E2}$= 0.98I where $v_{id}$ = $v_{B1}$- $v_{B2}$ and I is the tail current. (4)

b) Draw the block diagram and equivalent circuit of an operational amplifier. (3)

c) With the help of a neat circuit diagram, derive the equation for the output voltage of an Instrumentation amplifier. (8)

3 a) With the help of a circuit diagram, derive the equation for Input differential resistance of a differential amplifier. (4)

b) Explain the openloop configurations and voltage transfer curve of an ideal opamp. (3)

c) Explain the following properties of a practical opamp (i) Bandwidth (ii) Slew rate (iii) Input offset voltage (iv) Input offset current (8)

**PART B**

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

4 a) With the help of circuit diagram and relevant equations, explain the disadvantages of a differentiator. How are the disadvantages removed in a practical differentiator? (4 )

b) With the help of circuit diagrams and graphs, explain the working of a Full wave Precision rectifier. ( 3)

c) Design a Schmitt Trigger with hysteresis width, $V_H$= 2V. Assume ± $V_{sat}$= ± 14V. (4)

d) Design a second order Butterworth Low Pass Filter with $f_H$= 2KHz (4)

5 a) With the help of a circuit diagram, derive the equation for load current $I_{L,}$ for a V to I converter with grounded load. (3)

b) Derive the equation for frequency of oscillation ($f_0$) of a Wein Bridge oscillator. Design a Wein Bridge oscillator for $f_0$ = 1KHz. (6)

c) Derive the equation for the transfer function of a first order wide Band Pass filter. Design a first order wide bandpass filter with $f_H$= 2KHz and $f_L$= 500 Hz (6)

6 a) Draw the circuit of a log amplifier with temperature compensation and derive the equation for its output voltage. (7)

b) Derive the equation for frequency of oscillation for a square-triangular waveform generator. (8)

## PART C

***Answer any two full questions, each carries 20 marks.***

7 a) With the help of circuit diagram, internal functional diagram and relevant graphs, explain the working of a Monostable Multivibrator using IC555. ( 10)

b) With the help of a circuit diagram and truth table, explain the working of a Flash type ADC. ( 10)

8 a) With the help of circuit diagram and internal diagram, explain the working of a Low Voltage Regulator using IC723. ( 10)

b) With the help of a circuit diagram explain the working of a Dual slope ADC. ( 10)

9 a) With the help of block diagram explain the working of PLL. Explain any two applications of PLL. ( 10)

b) The basic step of a 9bit DAC is 10mV. If 000000000 represents 0V, what output is produced if the input is 1100011001? (5)

c) Define the following terms with respect to DAC (i)Resolution (ii)Linearity (iii) Full scale output voltage (iv) LSB (v)MSB (5)

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