

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)  $V_{b1}=1V$ ,  $V_{b2}=1V$  (iii)  $V_{b1}=-1V$ ,  $V_{b2}=1V$  (4)
- b) List out the ideal characteristics of an op.amp. (3)
- c) Design the circuits to obtain the following output,  $V_o$ . (i)  $V_o= (5V_1)$  (8)  
(ii)  $V_o= V_1+ 2V_2$  (iii)  $V_o = - \frac{V_1+V_2+V_3}{3}$  (iv)  $V_o= - 2V_1- 5V_2$
- 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 (8)  
(iii) Input offset voltage (iv) Input offset current

**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  $\pm V_{sat}= \pm 14V$ . (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. (6)  
Design a Wein Bridge oscillator for  $f_0 = 1\text{KHz}$ .
- c) Derive the equation for the transfer function of a first order wide Band Pass filter. (6)  
Design a first order wide bandpass filter with  $f_H = 2\text{KHz}$  and  $f_L = 500\text{ Hz}$
- 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 110011001? (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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