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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)
