A 1100ECT301122103 Pages: 2

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2022 (2019 Scheme)

Course Code: ECT 301

Course Name: LINEAR INTEGRATED CIRCUITS

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) Marks

1		What are the ideal characteristics of an op-amp.?	3
2		Define Slew rate? Explain its significance.	3
3		Discuss the concept of virtual ground.	3
4		State how practical integrator is different from simple integrator circuit, with relevant sketches.	3
5		Draw the circuit of an op-amp monostable multivibrator and write down the expression of time period.	3
6		What are the advantages of active filters over passive filters?	3
7		Design a free-running multivibrator using 555 for a frequency of 1 KHz and a duty cycle of 60%. Choose C= 0.1μF.	3
8		Mention three applications of PLL.	3
9		Explain the features and functional block diagram of IC 723.	3
10		List out DAC specifications.	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	a)	Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration.	7
	b)	How a constant current bias circuit can be used to improve the CMRR of a differential amplifier?	7
12	a)	Draw the block diagram of an op-amp and explain the functions of each block.	7
	b)	Draw the equivalent circuit of an op-amp and explain the voltage transfer characteristics of an op-amp.	7

Module -2

13 a) 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) $V_o = -2V_1 - 5V_2$

b) Derive the following characteristics of voltage shunt amplifier: (i) Closed loop voltage gain (ii)Input resistance (iii) Output resistance (iv)Bandwidth 6

14 a) What is a logarithmic amplifier? Draw the circuit and derive the transfer function of a logarithmic amplifier. 7

b) Draw and explain the circuit of a voltage to current converter with grounded load and derive its transfer function. 7

Module -3

15 a) With the help of circuit diagram explain the operation of RC phase shift oscillator using op-amp. Derive the expression for frequency of oscillation and the minimum gain requirement for sustained oscillation. 10

b) Design a first order low pass filter with the following specifications (i)-3dB frequency 1 KH_z , (ii) DC gain 20dB. Choose C= 0.01μF. 4

16 a) Design a circuit to generate a triangular waveform of $7V_{P-P}$ at 1 KH_z using an op-amp having saturation voltage of ±14 V and draw the waveforms also. 7

b) Derive the equation for the frequency of oscillation of an opamp astable multivibrator with the help of circuit diagram and waveforms. 7

Module -4

17 a) Draw the functional block diagram of 566 VCO and explain its operation. 7

b) Explain the operation of PLL. What is its lock range and capture range. 7

18 a) List the features of Timer IC 555 4

b) Draw the internal diagram of a 555 timer and explain its working as a monostable multivibrator and derive the expression for its pulse-width. 10

Module -5

19 a) Discuss how the IC 723 can be used as high voltage regulator with current limit and with current fold back. 7

b) Draw and explain the working of successive approximation type ADC. 7

20 a) With neat circuit diagram explain the working of a 3-bit flash ADC. 7

b) Explain the circuit of a 4-bit R-2R ladder DAC. 7

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