ENTRI

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2022 (2019 Scheme) (p. 1)

Course Code: ECT 301

Course Name: LINEAR INTEGRATED CIRCUITS

Max. Marks: 100 | Duration: 3 Hours (p. 1)

PART A

(Answer all questions; each question carries 3 marks) **(p. 1)**

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

PART B

(Answer one full question from each module, each question carries 14 marks) **(p. 1)**

Module - 1 (p. 1)

11. a) Derive CMRR, input resistance and output resistance of a dual input balanced output differential amplifier configuration. (7 marks) (p. 1)

b) How a constant current bias circuit can be used to improve the CMRR of a differential amplifier? (7 marks) (p. 1)

OR

12. a) Draw the block diagram of an op-amp and explain the functions of each block. (7 marks) (p. 1)

b) Draw the equivalent circuit of an op-amp and explain the voltage transfer characteristics of an op-amp. (7 marks) (p. 1)

Module - 2 (p. 2)

13. a) Design the circuits to obtain the following output,

V_o: (i) $V_o = (5V_1)$ (ii) $V_o = V_1 + 2V_2$ (iii) $V_o = -\left(\frac{V_1 + V_2 + V_3}{3}\right)$ (iv) $V_o = -2V_1 - 5V_2$ (8 marks) (p. 2)

b) Derive the following characteristics of voltage shunt amplifier: (i) Closed loop voltage gain (ii) Input resistance (iii) Output resistance (iv) Bandwidth (6 marks) (p. 2)

OR

14. a) What is a logarithmic amplifier? Draw the circuit and derive the transfer function of a logarithmic amplifier. (7 marks) (p. 2)

b) Draw and explain the circuit of a voltage to current converter with grounded load and derive its transfer function. (7 marks) (p. 2)

Module - 3 (p. 2)

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 marks) (p. 2)

b) Design a first order low pass filter with the following specifications: (i) -3dB frequency 1 KHz, (ii) DC gain 20dB. Choose C= 0.01μF. (4 marks) (p. 2)

OR

16. a) Design a circuit to generate a triangular waveform of $7V_{p-p}$ at 1 KHz using an op-amp having saturation voltage of $\pm 14V$ and draw the waveforms also. (7 marks) (p. 2)

b) Derive the equation for the frequency of oscillation of an op-amp astable multivibrator with the help of circuit diagram and waveforms. (7 marks) (p. 2)

Module - 4 (p. 2)

17. a) Draw the functional block diagram of 566 VCO and explain its operation. (7 marks) (p. 2)

b) Explain the operation of PLL. What is its lock range and capture range. (7 marks) (p. 2)

OR

18. a) List the features of Timer IC 555. (4 marks) (p. 2)

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 marks) (p. 2)

Module - 5 (p. 2)

19. a) Discuss how the IC 723 can be used as high voltage regulator with current limit and with current fold back. (7 marks) (p. 2)

b) Draw and explain the working of successive approximation type ADC. (7 marks) (p. 2)

OR

20. a) With neat circuit diagram explain the working of a 3-bit flash ADC. (7 marks) (p. 2)

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