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Reg No.: \_\_\_\_\_

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S3 (PT) (R, S) Examination December 2023 (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  | Discuss the frequency response curve of an operational amplifier.   | 3 |
| 2  | Differentiate between the open loop configurations of inverting and non-inverting amplifiers.   | 3 |
| 3  | Discuss the concept of virtual ground in inverting amplifiers.  | 3 |
| 4  | Explain the working of voltage to current converter with floating load.   | 3 |
| 5  | Design a notch filter to eliminate power supply hum (50Hz)  | 3 |
| 6  | Design a RC Phase Shift Oscillator for a frequency of oscillation of 600 Hz using $\mu A 741$ .   | 3 |
| 7  | In a VCO. if input signal frequency is 10 kHz, free running frequency is 14kHz, voltage to frequency conversion factor is 2kHz/V, find the change in the dc control voltage, during lock. | 3 |
| 8  | Explain how PLL can be used as a frequency multiplier.  | 3 |
| 9  | Find the resolution and dynamic range of a digital to analog converter, if the maximum peak to peak output voltage is 5V and the input signal is a 10 bit word.                           | 3 |
| 10 | Explain how 723 IC can be used as a high voltage regulator. Give the equation for output voltage.   | 3 |

**PART B**

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

**Module -1**

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|----|--|---|
| 11 | a) Explain the block diagram of an operational amplifier. List out any four ideal op amp characteristics.              | 7 |
|    | b) Define a) Power Supply Rejection Ratio b) Input Bias Current of an op amp. Draw the equivalent circuit of an opamp. | 7 |
| 12 | a) Discuss the transfer characteristics of differential amplifiers.  | 7 |

- b) Explain how differential amplifier using constant current bias improves CMRR. 7

**Module -2**

- 13 a) Derive the equation for the output voltage for an instrumentation amplifier using 3 op amps. 7  
b) Explain the working of full wave precision rectifier. 7
- 14 a) Derive the equation for closed loop voltage gain, input and output resistance of voltage shunt feedback amplifier. 7  
b) Derive the equation for output voltage for a differentiator. Explain the frequency response of differentiator. 7

**Module -3**

- 15 a) Illustrate how the following filters can be implemented using opamp. Draw their frequency response. 7  
1) Band Pass Filter      2) Band Reject Filter.
- b) Derive the equation for voltage gain for first order low pass filter. Using the gain magnitude equation illustrate the variation of gain with respect to frequency. What is frequency scaling? 7
- 16 a) Explain the working of a monostable multivibrator using 741. Derive the equation for pulse width. 7  
b) Explain the working of triangular wave generator. Derive the equation for frequency of oscillation. 7

**Module -4**

- 17 a) Explain the astable operation of 555 timer I.C. Derive the equation for frequency of oscillation. 7  
b) Draw the pin diagram of 555 timer I.C. Design a monostable multivibrator using 555 timer I.C for a pulse width of 1 ms. Draw the circuit diagram. 7
- 18 a) Explain the block diagram of Voltage Controlled Oscillator. Derive the equation for frequency of oscillation. 7  
b) Using closed loop analysis, find the transfer function of the Phase Locked Loop. 7

**Module -5**

- 19 a) Discuss the functional block diagram of 723 regulators. Draw the pin configuration of I.C 723. 7

- b) Using functional diagram, explain how regulation is achieved in low voltage regulators using 723. Draw the circuit diagram of low voltage regulator using 723 IC 7
- 20 a) Explain the working of flash type ADC. 7
- b) An 8 bit Analog to Digital Converter accepts an input voltage signal of range 0 to 10V. What is the minimum value of the input voltage required to generate a change of 1 LSB.? Determine the input voltage required to generate all 1's at the output? What is the digital output for an input voltage of 4.8 V 7

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