

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R, S) / S3 PT Examination November 2025 (2019 Scheme)

Course Code: ECT301**Course Name: LINEAR INTEGRATED CIRCUITS**

Max. Marks: 100

Duration: 3 Hours

PART A*(Answer all questions; each question carries 3 marks)*

Marks

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| 1 | Sketch the transfer characteristics of a dual input balanced output differential amplifier showing linear and limiting regions. Comment on the same. | 3 |
| 2 | Define Slew Rate and CMRR. Give the typical value of slew rate & CMRR for a 741C op-amp. | 3 |
| 3 | Draw the circuit diagram of an ideal opamp integrator. Obtain an expression for output voltage. How will the integrator respond to a dc input. | 3 |
| 4 | A person was experimenting with an inverting amplifier after designing it for a gain of 1. But during setup he accidentally interchanged connections to inverting pin and non inverting pins. In such a case, plot the transfer characteristic of the wrongly wired circuit. | 3 |
| 5 | Explain Barkhausen criteria for sustained oscillations. | 3 |
| 6 | Design a narrow band pass filter with two feedback paths with a centre frequency of 1.5 KHz, $Q=7$, and pass band gain of 15. | 3 |
| 7 | Explain how a PLL can be used as a frequency multiplier. | 3 |
| 8 | With the help of a diagram, explain the internal schematic of 555 IC. | 3 |
| 9 | Explain simple current limiting mechanism in IC 723. Mention its disadvantages. | 3 |
| 10 | Mention any three types of ADCs. | 3 |

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

Module -1

- 11 a) Draw the circuit diagram of a Wilson current mirror circuit using BJT. Prove that output current is same as reference current for the circuit. 7
- b) Prove that the common mode gain of a Dual input balanced output Differential Amplifier decreases with increase in Emitter Resistance. 7
- 12 a) A differential amplifier has a differential gain of 80dB and CMRR of 95 dB. If $V_1 = 2\mu V$ and $V_2 = 1.6\mu V$, calculate the differential voltage and common mode voltage. 7
- b) Derive the expression for the differential input resistance & output resistance for a dual input balanced output differential amplifier using BJT. 7

Module -2

- 13 a) Draw the circuit diagram of a basic logarithmic amplifier using Diode. Derive an expression for output voltage in terms of input voltage. 7
- b) Explain the working of a precision full wave rectifier using op-amp. 7
- 14 a) Explain the features of an instrumentation amplifier. Design an instrumentation amplifier for a gain of 1000. 8
- b) Draw the circuit diagram of a voltage to current convertor with grounded load and obtain an expression for load current. 6

Module -3

- 15 a) Design a second order low-pass Butterworth filter having upper cut-off frequency of 1 KHz. Plot its frequency response. 7
- b) Design an astable multivibrator circuit using op-amp to generate a frequency of 1KHz. 7
- 16 a) Design a narrow band reject filter to eliminate 120 Hz frequency. 7
- b) Draw the circuit diagram of an op-amp based RC phase shift oscillator and design it for a frequency of 500 Hz. 7

Module -4

- 17 a) Design a circuit using 555 IC which will turn on a heater immediately after 7

pressing a push button and should make the heater in ON state for 5 seconds.

- b) With the help of a block diagram explain the internal schematic of VCO IC. 7
- 18 a) With the help of a block diagram explain the internal schematic of PLL. 7
- b) Design a 555 IC based circuit to generate an output signal with frequency of 1 KHz and duty cycle of 75%. 7

Module -5

- 19 a) Explain the working of a low voltage regulator using LM723C IC. 6
- b) Draw the circuit diagram of a 4-input binary weighted resistor DAC and derive an expression for output voltage. 8
- 20 a) Explain how current boosting and current limit protection is implemented in a LM723C IC. 7
- b) Explain the working of a 3-bit Flash Type ADC. 7
