Reg. No.															

B.Tech. DEGREE EXAMINATION, DECEMBER 2023

Fourth / Fifth Semester

18ECC202J – LINEAR INTEGRATED CIRCUITS

(For the candidates admitted from the academic year 2020 - 2021)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. In 8-pin package of 741, terminals _____ and _____ used for dc offset. (A) 1,5 (B) 2, 3 (C) 7,4 (D) 8, 6	1	1	1	1
2. Op-amp 741C has a low slew rate of (A) 0.6 V/μs (B) 0.5 V/μs (C) 00.5 mV/ μs (D) 0.5μV/μs	1	2	1	2
3. For 741C, CMRR is typically (A) 80 dB (B) 70 dB (C) 90 dB (D) 95 dB	1	1	2	1
4. The common-mode signal V_{cm} is defined as (A) $\frac{V_1 - V_2}{2}$ (B) $V_1 + V_2$ (C) $V_1 - V_2$ (D) $\frac{V_1 + V_2}{2}$	1	2	2	2
5. An amplifier with a gain of +5, has R_1 of $5k\Omega$ and R_f of _____ (A) 20 kΩ (B) 10 kΩ (C) 15 kΩ (D) 5 kΩ	1	1	3	2
6. Another name for a unity gain amplifier is (A) Difference amplifier (B) Comparator (C) Single ended (D) Voltage follower	1	1	2	3
7. A circuit whose output is proportional to the difference between the input signals is considered to be which type of amplifier? (A) Common mode (B) Darlington (C) Differential (D) Operational	1	1	2	2

8. If the input to a comparator is a sine wave, the output is 1 2 2 3
(A) Ramp voltage (B) Sine wave
(C) Rectangular wave (D) Sawtooth wave

9. In the design of RC phase shift oscillator to generate 100 Hz signal, if $C = 0.01\mu F$, then R is 1 2 3 1
(A) 64.9 kΩ (B) 6.49 kΩ
(C) 649 Ω (D) 64.9 Ω

10. Which among the following can be used to detect the missing heart beat? 1 2 3 2
(A) Monostable multivibrator (B) Astable multivibrator
(C) Schmitt trigger (D) Comparator

11. The signal _____ shifts the VCO frequency in a direction to reduce the frequency between f_s and f_0. 1 3 3 1
(A) V_s (B) V_e
(C) V_c (D) V_0

12. PLL is used in 1 2 3 1
(A) AM detection (B) QAM
(C) BPSK (D) QPSK

13. In which filter the output and input voltages are equal in amplitude for all frequencies? 1 1 4 2
(A) All pass filter (B) Low pass filter
(C) High pass filter (D) Band pass filter

14. Name the filter that has two pass bands 1 2 4 2
(A) Band pass filter (B) Low pass filter
(C) High pass filter (D) Band reject filter

15. What is the dropout voltage in a 3 terminals IC regulators? 1 3 4 1
(A) $|V_{in}| \geq |V_0| + 2V$ (B) $|V_{in}| < |V_0| - 2V$
(C) $|V_{in}| = |V_0|$ (D) $|V_{in}| < |V_0|$

16. The % load regulation of a power supply is ideally _____ and practically _____. 1 3 4 2
(A) Zero, small (B) Small, zero
(C) Zero, large (D) Large, zero

17. A monotonic DAC is one whose analog output increases for _____ 1 1 5 2
(A) Decrease in digital input (B) An increase in analog input
(C) An increase in digital input (D) Decrease in analog input

18. Find the resolution of a 10-bit ADC for an input range of 10 V. 1 1 4 3
(A) 97.7 mV (B) 9.77 mV
(C) 0.977 mV (D) 977 mV

19.	Which ADC is considered to be simplest, fastest and most expensive? (A) Servo tracking (B) Counter type (C) Flash type (D) Successive approximation	1	1	4	2
20.	Successive approximation type ADC completes n-bit conversion in _____ clock periods. (A) $2^n - 1$ (B) 1 (C) n (D) $2^n + 1$	1	1	4	3

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	List the characteristics of an ideal op-amp. Give practical values.	4	2	1	3
22.	Draw the block schematic of an op-amp and explain.	4	3	2	1
23.	Draw the circuit of a transconductance amplifier and explain the operation.	4	2	3	2
24.	Design an adder circuit using an op-amp to get output expression as $V_0 = -(0.5V_1 + V_2 + 15V_3)$. Where V_1, V_2 and V_3 are the inputs.	4	3	3	1
25.	State the two condition of oscillation.	4	3	4	2
26.	Draw the basic structure of feedback oscillator.	4	3	4	1
27.	Write short notes on switched capacitor filter.	4	4	4	2

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.	List the non-ideal DC characteristics of an op-amp. Explain them.	12	3	1	4
	(OR)				
b.i.	List the frequency compensation techniques. Explain any one.	6	2	1	3
ii.	For the non-inverting amplifier, $R_1 = 1k\Omega$ and $R_f = 10k\Omega$. Calculate the maximum output offset voltage due to V_{ios} and I_B. The op-amp is LM307 with $V_{ios} = 10mV$ and $I_B = 300nA$, $I_{os} = 50nA$. Calculate the value of R_{comp} needed to reduce the effect of I_B. Calculate the maximum output offset voltage of R_{comp} is connected.	6	3	2	1
29. a.	List the important features of instrumentation amplifier. Explain the operation of instrumentation amplifier with neat diagram.	12	3	2	1
	(OR)				
b.	Draw the circuit of a log amplifier and explain its operation with derivation of output.	12	3	2	1
30. a.	With relevant diagram, explain the operation of triangular wave generator.	12	3	3	1
	(OR)				

b.i.	Derive the expression of time delay of monostable multivibrator using 555 timer.	8	3	3	1
ii.	In the astable multivibrator using 555 timer if $R_A = 4.7k\Omega$, $R_B = 1.5k\Omega$ and $C = 0.1\mu F$. Calculate t_{HIGH}, t_{LOW}, free running frequency and duty cycle D.	4	3	3	1
31. a.i.	With a neat diagram, explain the operation of narrow band pass filter.	8	4	3	1
ii.	Design a wide-band pass filter having $f_l = 400Hz$, $f_h = 2kHz$ and passband gain of 4. Find the value of Q of the filter.	4	4	3	1
	(OR)				
b.i.	What are the limitations of three terminal regulator?	2	3	2	4
ii.	Draw the functional diagram of 723 regulator and explain.	10	3	2	4
32. a.	Explain the operation of R-2R ladder DAC with neat diagram.	12	3	4	3
	(OR)				
b.	With relevant diagrams explain the operation of ramp type ADC.	12	3	4	3

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