Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: BE04000051 **Date: 16/06/2026**

Subject Name: Linear Integrated Circuits

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1 **(a)** Define an operational amplifier. List the four key building blocks inside a typical op-amp and state the primary function of each. **03**

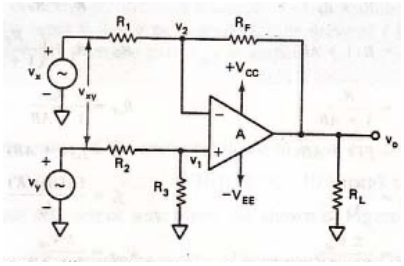
(b) Name and describe three basic IC package types. Which is exclusively used for digital ICs? **04**

(c) Explain the meaning and significance of the following µA741C electrical parameters: (a) Input Offset Voltage, (b) Input Bias Current, (c) Input Offset Current. **07**

Q.2 **(a)** What are the benefits of using negative feedback in an op-amp circuit? List at least four advantages. **03**

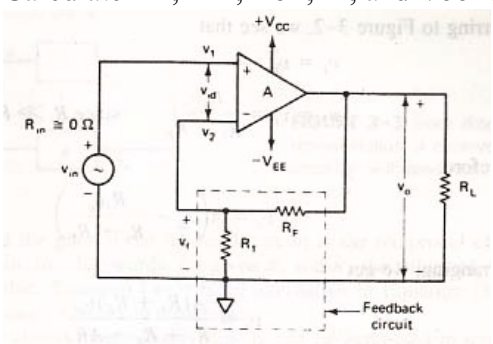
(b) Explain the current-to-voltage converter derived from the inverting amplifier. Write its output voltage equation. **04**

(c) For the differential amplifier of Fig: R1=R2=1kΩ, RF=R3=10kΩ, op-amp is 741C. (a) Find gain AD and input resistance. (b) Find output voltage if Vx=2.7Vpp and Vy=3Vpp sine waves at 100Hz. **07**



OR

Q.2 **(c)** A 741C op-amp is connected as a noninverting amplifier with R1 = 1 kΩ, RF = 10 kΩ. Given: A = 200,000, Ri = 2 MΩ, Ro = 75 Ω, fo ≅ 5 Hz, output swing = ±13 V. Calculate AF, RiF, RoF, fF, and VooT. **07**



Q.3 **(a)** What is an offset voltage-compensating network? Why is it necessary before using an op-amp as a dc amplifier? **03**

(b) Write the expression for total output offset voltage VooT for (a) an amplifier without ROM and (b) an amplifier with ROM. **04**

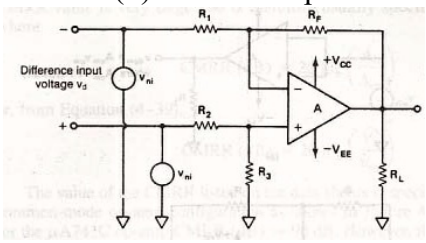
(c) Define error voltage Ev for an inverting amplifier. Derive the expression for Ev due to thermal drift in Vio and Iio. **07**

OR

Q.3 **(a)** Define Supply Voltage Rejection Ratio (SVRR). Express it in μV/V and in dB. Give an example conversion. **03**

(b) At what range of supply voltages does the open-loop voltage gain of the 741C vary at TA = 25°C? Why is a higher open-loop gain desirable? **04**

(c) In the differential amplifier of Figure, R1=R2=1 kΩ, RF=R3=10 kΩ, vd=5 mV sine at 1 kHz, vni=2 mV at 60 Hz. Op-amp is μA741 with CMRR=90 dB. Find (a) output at 1 kHz and (b) noise at output at 60 Hz. **07**



Q.4 **(a)** What is the fundamental difference between a DC amplifier and an AC amplifier using an op-amp? When is an AC amplifier preferred over a DC amplifier? **03**

(b) Draw the circuit diagram of an AC inverting amplifier using a 741 op-amp with a coupling capacitor. Derive the expression for its low-frequency cutoff fL. **04**

(c) Derive the expression for peak frequency fp, peak gain AF, and bandwidth BW of a peaking amplifier. State conditions for each formula. **07**

OR

Q.4 **(a)** What are the desirable characteristics of an instrumentation amplifier? Name two dedicated instrumentation op-amp ICs. **03**

(b) Draw the inverting summing amplifier circuit with three inputs Va, Vb, Vc. Derive the output voltage expression. **04**

(c) Explain the frequency response of a practical integrator. Define fa and fb. In what frequency range does it act as a true integrator? **07**

Q.5 **(a)** What is the function of clamp diodes at the input of an op-amp comparator? **03**

(b) List the important characteristics required for an op-amp to be used as a comparator. Explain why a wide bandwidth is necessary. **04**

(c) Explain the operation of a 555 Timer configured as a monostable multivibrator along with the capacitor voltage and output waveforms. **07**

OR

Q.5 **(a)** Explain internal structure of Operational Transconductance Amplifier. **03**

(b) What are the advantages of adjustable voltage regulators (like LM317) over fixed voltage regulators? **04**

(c) In an astable multivibrator using a 555 timer, calculate the positive pulse width, negative pulse width, and free-running frequency if RA = 2.2 kΩ, RB = 3.9 kΩ and C = 0.1 μF. **07**

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