



JK LAKSHMIPAT UNIVERSITY JAIPUR
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), Nov-Dec 2016
B. Tech. in EE/ECE, Semester - V

Roll No.....

ECE501: Linear Integrated Circuits

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. A certain non-inverting amplifier has R_i of $1.0\text{ k}\Omega$ & R_f of $100\text{ k}\Omega$. The closed loop gain is -----.
(a) 1,00,000 (b) 100 (c) 101 (d) 1000
- ii. Assuming that the op-amp in the circuit shown below is ideal, the output voltage V_o (in volts) is -----.

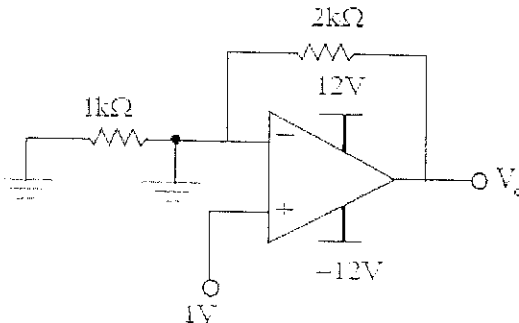


Fig.Q.1(ii)

- iii. The 78XX series of voltage regulators produce an output voltage that is -----.
(a) Positive (b) Negative (c) either positive or negative (d) unregulated
- iv. The zero-level detector is one application of -----.
(a) Comparator (b) differentiator (c) summing amplifier (d) diode
- v. When negative feedback is used, the gain-bandwidth product of an op-amp
(a) increases (b) decreases (c) remains same (d) fluctuates
- vi. The gain of the basic integrator ----- & that of the basic differentiator -----, with increase in frequency.
(a) increases, decreases (b) decreases, increases (c) increases, also increases
(d) decreases, also decreases
- vii. Schmitt trigger is a comparator with -----.

- (a) Positive feedback (b) Negative feedback (c) compensating capacitor
(d) Negative feedforward
- viii. A third order low pass filter will have a roll off rate of ----- dB/decade.
(a) 20 (b) 40 (c) 60 (d) 8
- ix. Successive approximation type ADC completes n-bit conversion in ----- clock periods.
(a) n (b) 2^n (c) 2n (d) n-1
- x. Usually in PLL, the lock-in range is ----- capture range.
(a) Greater than (b) smaller than (c) equals the (d) half of

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- Define the following terms for a typical op-amp.
(a) Input offset voltage (b) CMRR (c) Slew Rate (d) SVRR (e) Output voltage swing
- Draw the circuit of a voltage follower using op-amp and explain the circuit. Why it is also called as non-inverting buffer?
- Determine the output voltage that would be produced by a D/A converter, whose output range is 0 to 10 V and input number is 1010 (4-bit DAC).
- What are voltage regulators? Mention the typical IC Nos which are used for fixed positive and negative voltage regulations.

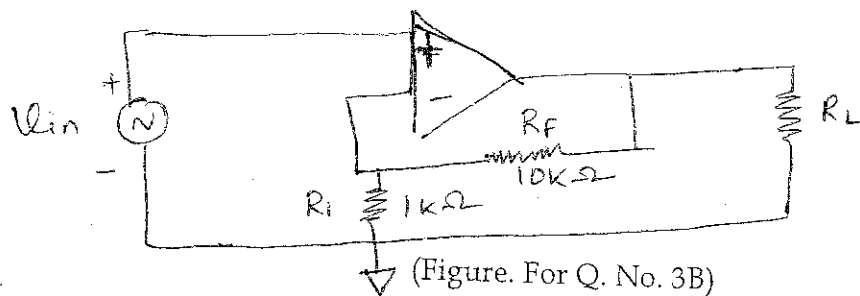
Q.3A What is feedback amplifier? Explain briefly the all possible feed-back configuration through block diagrams.

05

Q.3B For the following amplifier circuit uses the op-amp 741 with the specifications mentioned below. Then calculate voltage gain, Input Resistance, Output Resistance, Bandwidth and total output offset voltage for the given amplifier.

05

$$(A = 2 \times 10^5; R_i = 2 \text{ M}\Omega; R_o = 75 \Omega; f_0 = 5 \text{ Hz}; \text{Supply voltages} = \pm 15 \text{ V}; \text{Output voltage swing} = \pm 13 \text{ V})$$

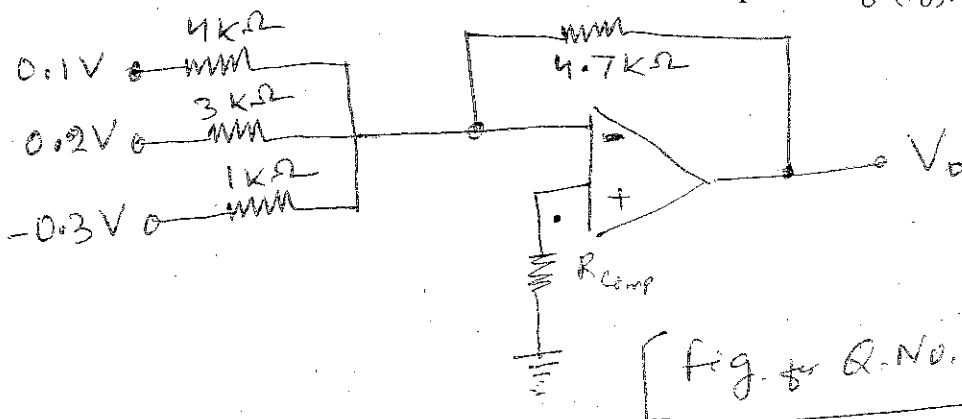


Q.4A Through proper circuit, briefly explain the principles of voltage to current conversion and current to voltage conversion.

05

Q.4B For the circuit given as Fig. 4B, find the output voltage (V_o).

05



- Q.5A A Schmitt trigger with the upper threshold level $V_{UT} = 0\text{ V}$ and the hysteresis width $V_H = 0.2\text{ V}$ converts a 1KHz sine wave of amplitude $4V_{pp}$ into a square wave. Calculate the time duration of the negative and positive portion of the output waveforms. 05
- Q.5B Briefly explain the function of an inverting comparator. Sketch the appropriate circuit and the input/output waveforms. Also briefly explain its application as zero crossing detectors. 05
- Q.6A Design a practical differentiator circuit to differentiate signals in the range from 500Hz to 1000Hz assuming $C_1 = 0.1\text{ }\mu\text{F}$. For the input signal $v_{in} = 0.4 \sin 2\pi(1000)t$ volts, find the expression for the output signal. 05
- Q.6B Draw the practical circuit of an integrator (lossy integrator) and explain how it avoids the problems faced by the basic integrator. Draw the frequency response curve and label it properly. 05
- OR
- Q.6B Draw the circuit of a basic differentiator using op-amp. Draw the output waveform for a square wave input. Identify the limitations of this differentiator circuit. Suggest for a proper solution. 05
- Q.7A Design a first order low pass filter for a high cut-off frequency of 2 KHz and pass band gain of 2. (Assume the appropriate value of the capacitor/resistor) 05
- Q.7B State the differences between a clipper and clamper circuit. Draw the circuit of a positive clamper and explain it briefly. Draw the input and output waveforms also. 05
- OR
- Q.7B What you mean by active filters? Outline the differences among low pass, high pass, band pass, band stop filters. Sketch their respective frequency response and label them properly showing the pass band and stop band regions. 05
- Q.8A Design a fourth order Butterworth low-pass filter having upper cutoff frequency 1 KHz. Assume the capacitance, $C = 0.1\text{ }\mu\text{F}$ and the normalized Butterworth polynomial (4th order) as $(s_n^2 + 0.765 s_n + 1)(s_n^2 + 1.848 s_n + 1)$. 10
- Q.9A What is PLL? Draw the block diagram and explain in detail each component. For an arbitrary input signal draw the out of the Exclusive -OR & Edge-triggered phase detector. 10
- Q.9B Explain the principle of basic DAC technique. Draw the circuits and make a comparison amongst Weighted Resistor, R-2R ladder & Inverted R-2R ladder DAC techniques. 10
- OR
- Q.9B State the basic principle of A-D converter. Briefly explain the successive approximation methods and dual-slope methods of DAC. 10