



CBCS SCHEME

15EE46

Fourth Semester B.E. Degree Examination, June/July 2019 Operational Amplifiers and Linear IC's

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Design a capacitor coupled inverting amplifier for lower cut-off frequency (f_L) of 10Hz, voltage gain of 50, output voltage of 2.5V using 741 op-amp. (05 Marks)
- b. Consider an amplifier circuit using op-amp with voltage series feedback. Derive an expression for the exact closed loop gain and input impedance of the circuit with feedback. (06 Marks)
- c. With a circuit of 3-input summing amplifier in inverting mode, derive an expression for output in terms of input voltages. Indicate under which condition, circuit can be used as averaging circuit. (05 Marks)

OR

- 2 a. Write a single stage amplifier using differential configuration with 4-inputs (V_1, V_2, V_3, V_4) to obtain an output $V_0 = (-V_1 - V_2 + V_3 + V_4)$. Derive the above equation. (04 Marks)
- b. With a neat circuit, explain instrumentation amplifier (with 3-op-amps) using transducer bridge to detect change in temperature. (06 Marks)
- c. Write a neat circuit of capacitor coupled high Z_{in} voltage follower. Obtain the expression for input impedance of the circuit and write design equations. (06 Marks)

Module-2

- 3 a. With a circuit and frequency response curve, explain I order high pass filter. Derive an expression for the gain. (06 Marks)
- b. Explain the operation of adjustable voltage regulator using LM317 regulator. With the help of block diagram. (05 Marks)
- c. Design a voltage follower type regulator circuit using 741 op-amp and Zener of 12V with $I_z = 25mA$ to meet the following : i) Output voltage 12V ii) Maximum load current = 50mA. (05 Marks)

OR

- 4 a. With a circuit and frequency response curve, explain multistage wide band reject filter using highpass, lowpass and summing amplifier. Design the same to have $f_1 = 400Hz$ and $f_2 = 2KHz$ and passband gain of 2. (09 Marks)
- b. Explain with a neat circuit, adjustable output regulator using voltage follower. (07 Marks)

Module-3

- 5 a. With circuit and waveforms, explain square wave/triangular wave signal generator. (06 Marks)
- b. With circuit and waveforms, explain how Barkhausen criterion is met in RC phase shift oscillator. Design the same using $\pm 12V$ supply, for an output frequency of 3.5KHz using 741 op-amp. (06 Marks)
- c. Write the circuit of voltage of current converter with grounded load. Derive an expression for output current. (04 Marks)

OR

- 6 a. With a circuit, explain how signal generator outputs (amplitude and DC levels) are controlled. (04 Marks)
- b. Design an inverting Schmitt trigger for $LTP = 0\text{ V}$ and $UTP = +3\text{V}$. Using 741 with $|V_{\text{osat}}| = 12\text{V}$. Write transfer characteristics and output wave form for an input signal of $10 \cos \omega t$. (07 Marks)
- c. Explain with a circuit, non inverting Schmitt trigger to obtain different LTP and UTP values. Write the transfer characteristics. (05 Marks)

Module-4

- 7 a. With circuit and relevant waveforms, explain full wave precision rectifier (using half wave rectifier and summing circuit). Derive an expression for output voltage showing full wave rectification. (07 Marks)
- b. With the help of circuit and waveform, explain negative precision clamping circuit. (04 Marks)
- c. Explain 3-bit R/2R ladder type DAC with circuit. (05 Marks)

OR

- 8 a. Briefly explain with circuit, voltage follower type positive peak detector. Design the same to be suitable for a pulsed input of 2.5V peak and $5\mu\text{s}$ rise time. Peak value is to be held for $100\mu\text{s}$ with maximum error of 1%. Also determine $I_{0(\text{max})}$. Use BIFET op-amp. (06 Marks)
- b. With the help of block diagram, explain successive approximation ADC. (05 Marks)
- c. With the help of block diagram and waveform, explain dual slope ADC. (05 Marks)

Module-5

- 9 a. Explain the operation of PLL with block diagram. Briefly explain function of each component part. (06 Marks)
- b. Briefly explain any two applications of PLL together with block diagram. (06 Marks)
- c. Mention the features of IC555Timer. (04 Marks)

OR

- 10 a. Write the pin diagram and block diagram of IC565PLL. (04 Marks)
- b. With circuit and waveform, explain how 555 Timer can be used as monostable multi-vibrator. (06 Marks)
- c. Derive an expression for duty cycle of astable multi-vibrator with the help of waveforms. Mention the applications of astable multi-vibrator. (06 Marks)

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