

CBCS SCHEME

15EE46



Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Operational Amplifiers and Linear ICs

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Explain the following terms:
(i) CMRR (ii) Slew Rate (06 Marks)
- b. For inverting amplifier obtain exact and approximate expression for gain A_f . Why inverting mode is preferred when compared with non-inverting mode? (06 Marks)
- c. State ideal characteristics of opamp. (04 Marks)

OR

- 2 a. Explain the working of non-inverting ac amplifier and derive an expression for lower cut off frequency f_L and $\left(\frac{V_o}{V_{in}}\right)$ (08 Marks)
- b. Consider adder circuit with 3 inputs V_a , V_b and V_c . Assume inverting mode. Show that this circuit can be used as summing amplifier, averaging amplifier and scaling amplifier. (08 Marks)

Module-2

- 3 a. For I order low pass filter, derive an expression for $\left|\frac{V_o}{V_{in}}\right|$ and expression for frequency scaling. Assume non-inverting mode. (08 Marks)
- b. Design a wide bandpass filter for $F_L = 200$ Hz, $f_H = 1$ kHz, passband gain = 4. Assume $C = 0.01 \mu\text{F}$ for CPF and $0.05 \mu\text{F}$ for HPF. Calculate Q-factor also. Draw the circuit diagram. (04 Marks)
- c. Explain the working of notch filter. (04 Marks)

OR

- 4 a. Compare shunt regulator and series regulator circuits. (05 Marks)
- b. Explain the working of voltage follower regulator using opamp. (07 Marks)
- c. Explain connection diagram of LM317 voltage regulator. (04 Marks)

Module-3

- 5 a. Obtain an expression for frequency of oscillation in Wein bridge oscillator using opamp and expression for minimum gain. (08 Marks)
- b. Explain working of square wave generator using opamp and state expression for frequency of oscillation. (08 Marks)

OR

- 6 a. Explain zero crossing detector and what are its drawback? (06 Marks)
- b. Explain working of voltage to current converter with grounded load. (05 Marks)
- c. Consider Schmitt trigger in inverting mode. $R_1 = 100 \Omega$, $R_2 = 56 \text{ k}\Omega$, $V_{in} = 1$ V, peak to peak sine wave, $V_{cc} = \pm 15$ V. calculate V_{ut} and V_{lt} . Draw the circuit diagram and waveform. (05 Marks)

Module-4

- 7 a. Explain working of precision free wave rectifier. Obtain expression for V_o in positive and negative half cycles. (08 Marks)
- b. Explain the working of peak detector. Draw the circuit diagram and different waveforms. (08 Marks)

OR

- 8 a. For digital to analog converted explain resolution, accuracy, monotonicity and conversion time. (08 Marks)
- b. Explain working of counter type ADC. Draw its block diagram and timing diagram. State its drawback. (08 Marks)

Module-5

- 9 a. Explain the internal architecture of IC 555 timer. Draw its block diagram and pin diagram also. (10 Marks)
- b. Design 555 timer based square wave generator to produce a symmetrical square wave of 1 kHz. $V_{cc} = 12\text{ V}$, draw the circuit diagram and draw the waveforms of V_c and V_o . Assume $C = 0.1\ \mu\text{F}$. (06 Marks)

OR

- 10 a. Explain the operating principle of PLL. Draw the block diagram. (06 Marks)
- b. Explain the application of PLL as frequency multiplier. (05 Marks)
- c. Consider PLL IC 565 circuit diagram. $R_1 = 10\ \text{k}\Omega$, $C_1 = 0.01\ \mu\text{F}$, $V_{cc} = \pm 10\text{V}$, calculate free running frequency, lock range and capture range and output range. Draw the circuit diagram. (05 Marks)

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