CBCS SCHEME

USN

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 $\left(\frac{V_0}{V_{in}}\right)$ **(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 μF for CPF and 0.05 μF 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 Ω, R_2 = 56 kΩ , V_{in} = 1 V, peak to peak sine wave, V_{cc} = ±15V. 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, monotonocity 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. $V_{cc} = 12$ V, draw the circuit diagram and draw the waveforms of V_c and V_o. Assume $C = 0.1$ μF. **(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. $R_1 = 10$ kΩ, $C_1 = 0.01$ μF, $V_{cc} = +/- 10$V, calculate free running frequency, lock range and capture range and output range. Draw the circuit diagram. **(05 Marks)**

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