CBCS Scheme

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15EE46

Fourth Semester B.E. Degree Examination, June/July 2017
Operational Amplifiers and Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define and explain the following terms : input offset voltage, input offset current and input bias current. **(06 Marks)**

b. For the noninverting amplifier configuration, obtain expressions for closed loop gain. A_f from basic concepts, show that difference input voltage is zero ideally and hence gain A_f from this concept and input resistance R_{if} with feedback. **(10 Marks)**

OR

2 a. For the noninverting ac amplifier using single supply $R_{ia} = 50\Omega = R_0$, $C_i = C_1 = 0.1\mu F$, $R_1 = R_2 = R_3 = 100k\Omega$, $R_F = 1M\Omega$, $V_{cc} = +15V$, gain $A_f = 11$, uGB = 1MHz. Calculate bandwidth of amplifier and maximum output voltage swing. Draw the circuit diagram. **(06 Marks)**

b. What is an instrumentation amplifier? For instrumentation amplifier using transducer bridge obtain an expression for output voltage V_o in terms of change in resistance ΔR of the transducer. Draw the circuit diagram. **(10 Marks)**

Module-2

3 a. For the II order lowpass filter, show that the pass band voltage gain is equal to 1.586 and also obtain an expression for high cut off frequency f_H. Draw the circuit diagram. **(10 Marks)**

b. Explain the working and design of opamp voltage follower regulator. **(06 Marks)**

OR

4 a. Design a wide band pass filter with $f_\alpha = 200Hz$, $f_H = 1KHz$ and pass band gain = 4. Assume capacitor value for high pass section = $0.05\mu F$ and for low pass section = $0.01\mu F$. Also calculate the value of Q-factor for the filter and center frequency. Draw the circuit diagram. **(06 Marks)**

b. An LM 317regulator is to provide a 6V output from 15V supply. The load current is 200mA. Design the circuit, calculate the power dissipation. Draw the circuit diagram. Select $I_1 = 1mA$, $V_{ref} = 1.25V$. **(05 Marks)**

c. Explain the working of notch filter. Draw its frequency response. State its common application. **(05 Marks)**

Module-3

5 a. Explain the working of Schmitt trigger in inverting mode. Draw its hysteresis curve. **(06 Marks)**

b. Draw and explain triangular wave generator using square wave generator and integrator method. Draw the required waveforms. **(10 Marks)**

OR

6 a. Explain the circuit of noninverting comparator. Draw the different waveforms when V_{REF} is positive and negative. **(06 Marks)**

b. Design a RC phase shift oscillator using opamp. Assume C =0.1μF frequency of oscillations = 200 Hz. Draw the circuit diagram. **(06 Marks)**

c. Explain the working of voltage to converter with grounded load. **(04 Marks)**

Module-4

7 a. What is the major limitation of conventional rectifier? Explain working of precision positive and negative half wave rectifier using noninverting type. **(10 Marks)**

b. Draw and explain working of dual slope ADC. **(06 Marks)**

OR

8 a. Explain the working of R – 2R ladder DAC. Assume that binary input is 001. **(05 Marks)**

b. Draw and explain the circuit of peak detector. Draw the waveforms. **(06 Marks)**

c. An 8-bit DAC has an output voltage range of 0 – 2.55 V. Define the resolution in at least 2 ways. **(05 Marks)**

Module-5

9 a. Explain operating principle of PLL. Hence define lock range, capture range, and pull in time. **(08 Marks)**

b. An astable multivibrator is to be designed for getting rectangular waveform for t_{ON} = 0.6ms. Total time period = 1ms. Assume C = 0.1μF Draw the circuit diagram. **(08 Marks)**

OR

10 a. Explain the function of various pins of IC 555 timer. **(08 Marks)**

b. Explain PLL IC565 application as frequency multiplier and frequency synthesizer. **(08 Marks)**

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