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10EC46

Fourth Semester B.E. Degree Examination, Dec.2018/Jan. 2019
Linear IC's and Applications

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain the operation of a basic op-amp, circuit. **(08 Marks)**
b. Define the following op-amp parameters and mention their typical values for op-amp 741 : i) CMRR ii) slew rate. **(04 Marks)**
c. Using a 741 op-amp, design a non-inverting amplifier to have a voltage gain of approximately 66. The input signal amplitude is 15mV. **(04 Marks)**
d. The difference of 2 input signals is to be amplified by a factor of 37. Each input has an amplitude of 50mV. Using Lf 353 Op-amp design a suitable circuit. **(04 Marks)**

2 a. Sketch the circuit of a high Zin capacitor coupled voltage follower. Briefly explain its operation and also show that the input impedance is very high compared to the capacitor coupled voltage follower. **(06 Marks)**
b. A capacitor coupled non-inverting amplifier using op-amp 741 is to have a gain of 100 and V_0 = 5V. The load resistance is 10kΩ and the lower cutoff frequency is to be 100Hz. Design a suitable circuit. **(06 Marks)**
c. Design a capacitor coupled inverting amplifier to operate with a +20V supply the minimum input signal level is 50mV, the voltage gain is to be 68, the load resistance is 500Ω, and the lower cutoff frequency is to be 200Hz. Use a 741 op-amp. **(08 Marks)**

3 a. Explain the phase–lag and phase–lead frequency compensation methods briefly. **(08 Marks)**
b. With the help of neat circuit diagram explain the Zin MOD method of frequency compensation. **(06 Marks)**
c. Determine the upper cut-off frequency and maximum distortion free output amplitude for a voltage follower when :
i) A 741 op-amp is used (f_2 = 800 KHz and S = 0.5V/μs)
ii) LF 353 op-amp is used (f_2 = 5MHz, S = 13V/μs). **(06 Marks)**

4 a. With a neat sketch, explain the working of a precision voltage source using op-amp with Zener diode. Derive an expression relating V_0 and V_z. **(07 Marks)**
b. Draw the circuit of an instrumentation amplifier. Explain its characteristics show how it voltage gain can be varied. **(07 Marks)**
c. Using bipolar op-amps with V_{CC} = ±15V, design the high input impedance precision full – wave rectifier circuit. The input peak voltage is to be 1V and no amplification is to occur. Assume adequate diode current as 500μA. **(06 Marks)**

PART – B

5 a. Briefly explain the operation of the following op-amp based applications with neat diagrams:
Sample and hold circuit
Logarithm amplifier. **(08 Marks)**

b. Using 741 op-amp with a supply of ±15V, design a phase shift oscillator to have an output frequency of 5KHz. Assume c = 0.01μF. **(04 Marks)**

c. With a neat circuit diagrams and waveforms briefly explain the operation of a triangular/rectangular wave generator. **(08 Marks)**

6 a. Explain the operation of an op-amp based monostable multivibrator using relevant waveforms. **(08 Marks)**

b. Using a 741 op-amp with a supply of ±12V, design an inverting schemitt trigger circuit to have trigger points at ±3V. **(06 Marks)**

c. Design a 2^{nd} order law-pass filter circuit to have a cutoff frequency of 1KHz. **(06 Marks)**

7 a. With a neat functional diagram explain the operation of a low voltage regulator using IC723. **(06 Marks)**

b. Discuss the performance parameters of a voltage regulator. **(06 Marks)**

c. What is the principle of operation of a switched mode power supply? Discuss their advantages and disadvantages. **(08 Marks)**

8 a. With a neat circuit diagram explain the operation of a 3 bit R-2R ladder DAC. Also derive the expression for its output voltage. **(06 Marks)**

b. Explain the operation of an astable multiivbrator using 555 timer with a neat functional diagram and waveforms. Derive the expression for its frequency a duty cycle. Given R_A = 2.2KΩ and R_B = 6.8kΩ and C = 0.01μF. Calculate T_{high}, T_{low}, duty cycle and f_0. **(10 Marks)**

c. Mention the applications of PLL. **(04 Marks)**

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