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B.E. / B.Tech DEGREE END SEMESTER EXAMINATION, NOV/DEC 2011
ELECTRINICS AND COMMUNCIATION ENGINEERING BRANCH
FIFTH SEMESTER

27

EC 9302 – LINEAR INTEGRATED CIRCUITS
(Regulations 2008)

Time: 3 Hours
Max.marks: 100

Answer ALL questions
PART-A

(10X2=20 marks)

1. A 100pf capacitor has a maximum current of 150μA. What is the slew rate?
2. What is active load? Where it is used and why?
3. Design an amplifier that will amplify an input signal of 0.25 volts peak-to-peak into an output signal of 12 volts peak-to-peak.
4. Draw and derive the expression for a log-amplifier.
5. How do you convert a basic multiplier to a squaring circuit?
6. You are given with the VCO of gain 25×10^3 Hz/v. If there is a change in the input control voltage from 1.0 volts to 1.65 volts, what is the change in the VCO frequency?
7. What is the quantization error in an A/D converter if each step of a 10 bit A/D converter with gain 1 and 10 volt full scale is 0.0098307 volts?
8. Determine all the resistor values required for an 8-bit $R/2^n R$ D/A Converter, assuming that the feedback resistor is 10 KΩ resistor.
9. Design a monostable circuit to have an output pulse of 50 seconds and the capacitor to be used is 0.01 μF.
10. Mention the various Sources of noise.

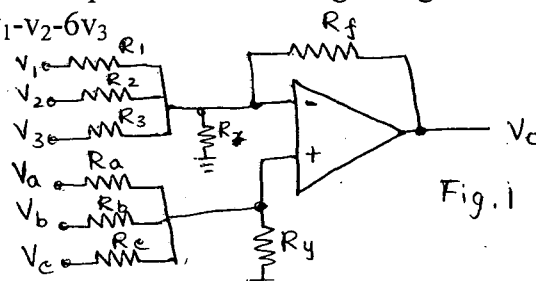
PART-B

(5X16=80 marks)

11. i. Draw and derive the output current for a Widlar current source. (4)
 ii. The input bias current I_B for the inverting op-amp amplifier is 500nA at 25°C. If $R_1=15K\Omega$ and $R_F=50K\Omega$, determine the output offset voltage due to I_B and offset minimizing resistance. (4)
 iii. Briefly explain about band gap reference circuit. (8)
- 12 a. i. Design a square wave oscillator with $f_o = 1KHz$. The op-amp is a 741 with DC supply voltages ± 15 volts. (4)
 ii. In an instrumentation amplifier using a transducer bridge, $R_1 = 1K\Omega$, $R_f = 4.7 k\Omega$, $R_A = R_B = R_C = 100k\Omega$, $V_{dc} = +5V$ and op-amp supply voltages $= \pm 15V$. The transducer is a thermistor with the following specifications: $R_T = 100k\Omega$ at a reference temperature of 25°C: temperature co-efficient of resistance = $-1k\Omega/^\circ C$ or $1\%/^\circ C$. Determine the output voltage at 0°C and at 100°C. (12)

(or)

- b. i. Design an add-subtract amplifier shown in fig.1 to give an output voltage of form $V_o = 5V_a + 9V_b + 3V_c - 2V_1 - V_2 - 6V_3$ (8)



- ii. Design a second order low pass and high pass butterworth filter for a cut-off frequency of 10KHz and $Q = 0.707$. (8)
- 13.a. Explain the operation of four quadrant trans-conductance multiplier circuit and derive for its output.. (16)
- (or)
- b. i. Explain any two applications of PLL in detail. (8)
- ii. A PLL is locked to the input signal with a frequency of 500 KHZ at a phase angle 0.75 volts and the amplitude of the VCO signal is 0.85volts. What is the frequency of the VCO? What is the Control voltage output of the phase detector if the phase detector is the multiplying type? (4)
- iii. A PLL IC 565 connected for FM detection has $R_1=8.3 \text{ K}\Omega$, $C_1= 0.001\mu\text{f}$, and $C=0.02 \mu\text{f}$. The supply voltage is 12V. Determine the (i) Free-running frequency (ii) Capture range and (iii) Lock -range. (4)
- 14 a. i. A dual slope A/D has $R=100\text{k}\Omega$ and $C= 0.01\mu\text{f}$. The reference voltage is 10 volts and the fixed integration time is 12ms. Find the conversion time for a 7.8 volt input. (4)
- ii. Explain the operation of a Voltage to time converter with suitable diagram. (4)
- iii. Explain the operation of 4-bit inverted R-2R ladder type of D/A converter in detail. If $R=R_f=10\text{k}\Omega$ and $V_R= 12\text{V}$, find the resolution, I_{out} and total current delivered to the Op-amp and the output voltage when the binary input is 1101. (8)
- (or)
- b. i. Design a 4-bit flash type A/D Converter. (8)
- ii. Write short notes on specifications of ADC and DAC. (8)
- 15 a. i. Discuss the application of three terminal voltage regulator as voltage and current source. (8)
- ii. Design a switched capacitor integrator circuit for $f_o = 100\text{Hz}$, assume $f_{\text{ck}}=10\text{KHz}$ and compare the circuit with monolithic integrator circuit. (8)
- (or)
- b. i. Explain any one type of Audio power amplifier with schematic diagram and highlight on its features. (8)
- ii. Using a 555 -timer chip and a 5Volt supply voltage design an astable oscillator to output a 30KHZ square wave. Comment on which resistor provides the smoothest change, which resistor provides largest change. Comment on the duty cycle as you vary the frequency with resistor R_A and resistor R_B . (8)