

26/11/13

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**B.E ( Full Time ) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013**

**ELECTRICAL & ELECTRONICS ENGINEERING**

23

Third Semester

**EE 8304 Linear Integrated Circuits**

(Regulation 2012)

Time : 3 Hours

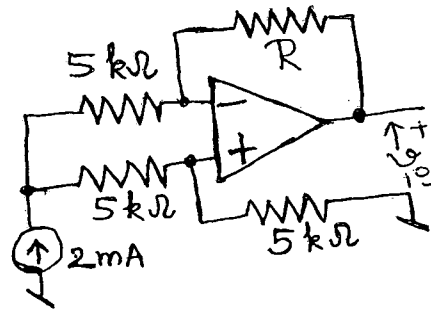
Answer ALL Questions

Max. Marks 100

**PART-A (10 x 2 = 20 Marks)**

1. What are the purposes for which  $\text{SiO}_2$  layer is employed during IC fabrication?
2. What are the advantages of using Aluminium as the metal layer in the IC fabrication?
3. Draw the circuit diagram of a 3 – OPAMP instrumentation amplifier ?
4. Define input offset current of an OPAMP?
5. Define 'lock - in range' of a PLL ?

6. Find the value of the resistance R, if the output voltage is found to be 3 V. Also evaluate the new output voltage that would be obtained when a resistance of 2 k $\Omega$  is connected across the current source.



7. What is an 'opto-coupler'? Where is it used?
8. Draw the circuit diagram of a precision full-wave rectifier?
9. Using a DC milli-ammeter, devise an OPAMP based circuit for measuring low voltage AC?
10. Given an OPAMP along with its 'slew rate' specification, how would you practically verify its slew rate?

**Part – B ( 5 x 16 = 80 marks)**

11. Explain how a Silicon wafer is prepared by crystal growth process? Also explain how 'photolithography' is helpful in IC fabrication? How are X-ray lithography and electron beam lithography better than this u-v photolithography ?
12. a) Draw the internal block diagram of a 555 timer? A 555 timer IC based astable multi-vibrator supplied with +15V supply, (& consisting of  $R_a = 2 \text{ k}\Omega$  ,  $R_b = 2 \text{ k}\Omega$  and timing capacitor  $C = 0.22 \mu\text{F}$ ) is used as a VCO. When regulated +12V is given to the modulation pin (pin5), evaluate the output frequency. Derive the expressions used, starting from basics.

**OR**

- b) i) Along with internal block diagram and derivation of expression for its output frequency, discuss how the voltage controlled oscillator IC 566 operates?  
ii) What is an analog multiplier? How is it useful as phase detector of a PLL ? (8+8)

13. a) What is a 'Voltage Regulator'? How would you employ IC 7805 for meeting each of the following requirements: i) Regulated 5V source with boosted current specifications, ii) Adjustable voltage regulator to provide voltage in the range (6 to 9 V). Also distinguish between linear and switching regulators.

OR

- b) How does a 'tri-angular waveform generator' work? Derive an expression for peak-to-peak output voltage and frequency of the tri-angular waveform generated? Select the values of the circuit parameters for obtaining 500Hz output frequency. How would you extend this circuit as a function generator (for generating sine-wave, as well)?

14. a) i) Design a 2nd order Chebyshev Low Pass Filter with a cut-off frequency of 600 Hz? Use  $A_0$  as 1.94.  
ii) What R-2R ladder type DAC? Considering 3-bit input number, give complete circuit. Show that output voltage is proportional to the input number, for the cases of inputs:  $110_2$  and  $011_2$ . (8 + 8)

OR

- b) i) Given a suitable window detector circuit, how would you achieve a 2-bit flash type analog to digital converter?  
ii) What is the role of Successive Approximation Register, in a Successive Approximation type analog to digital converter?  
iii) Discuss the operating principle of a dual slope type analog to digital converter. Show that the final reading of the counter is proportional to the input voltage? (4 + 5 + 7)

15. a) i) Draw the circuit diagram of an R-C phase shift oscillator. Derive an expression for its frequency of oscillations? What is the condition on its gain value? Design an R-C phase shift oscillator for a frequency of 400Hz.  
ii) Draw the circuit diagram of anyone Clipper or Clamper circuit and briefly discuss the operating principle. (10 + 6)

OR

- b) i) Draw the circuit diagram of an instrumentation amplifier using two OPAMPs. How would you make provision in this circuit for varying the gain employing only one variable resistance? Derive expression for the gain of this amplifier?  
ii) Derive an expression for the CMRR (Common Mode Rejection Ratio) of the OPAMP based Differential Amplifier circuit shown, with one of the resistance varying from its nominal value slightly. (8 + 8)

