

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER 2013****Subject Code: 151003****Date: 29-11-2013****Subject Name: Integrated Circuits and Applications****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What information is contained in a typical op-amp datasheet? Briefly explain. List three basic temperature grades for IC. What is the temperature range of 741C and 741A op-amp? **07**
- (b) Which type of feedback Non-inverting op-amp has? Derive input impedance and bandwidth with feedback for it. Draw the circuit diagram. **07**
- Q.2** (a) (i) A 741 op-amp as inverting amplifier is driven by peak to peak 10 volt sine wave. The closed loop gain is 4. Supply voltage of op-amp is +/-15V. Draw input and out waveforms. Show values of output peak voltage also. Give your remarks about output. **04**
- (ii) Define PSRR of an op-amp. In an op-amp PSRR is $150\mu\text{V/V}$. If supply voltage is changed from +10V to +12V, What is the change in input offset voltage V_{io} ? **03**
- (b) Draw the differential amplifier circuit using single op-amp and derive the expression for output voltage as a function of input voltages. Comment on its input resistance. **07**
- OR**
- (b) Consider an inverting operational amplifier with $R_F=100\text{K}\Omega$ and $R_1=1\text{K}\Omega$. Input offset voltage drift is $30\mu\text{V}/^\circ\text{C}$ and input offset current drift is $300\text{pA}/^\circ\text{C}$. Assume the amplifier is nulled at 25°C . Calculate the value of error voltage E_v and output voltage at 35°C if $V_{in}=1\text{mV}$ dc. **07**
- Q.3** (a) Explain voltage to current converter with floating load. Based on that show low voltage dc voltmeter circuit and discuss it. **07**
- (b) What do you understand by precision rectifier? Draw half wave precision rectifier circuit and explain with necessary waveforms. **07**
- OR**
- Q.3** (a) Draw and explain summing amplifier circuit using op-amp in inverting configuration based on that design a circuit such that $V_o = -2(3V_1+4V_2+2V_3)$. **07**
- (b) Explain op-amp based inverting comparator circuits with (i) positive reference voltage (ii) negative reference voltage. Show necessary waveforms. **07**
- Q.4** (a) Draw the internal block diagram of 555 timer IC and explain the operation in monostable mode. **07**
- (b) Explain op-amp based positive clipper circuit with necessary waveforms. Draw output waveforms for (i) Positive reference voltage (ii) Negative reference voltage. Assume input signal is sine wave. **07**
- OR**
- Q.4** (a) Explain how op-amp can be used to generate free running square wave with necessary circuit diagram and waveforms. Show how time period can be calculated. **07**
- (b) Explain the operation of 555 IC based astable multivibrator with necessary circuit diagram and waveforms. **07**

- Q.5** (a) Classify filters with four basic types. Explain ideal and practical characteristics of all. Draw attenuation characteristics also. **07**
- (b) Discuss fixed voltage regulators and adjustable voltage regulator with necessary circuit diagrams. **07**

OR

- Q.5** (a) Explain magnitude and phase response of low pass function for biquad circuit. **07**
- (b) Explain the operating principle of Phase Locked Loop **07**
