Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- Vth SEMESTER–EXAMINATION – MAY/JUNE - 2012

Subject code: 151003 **Date: 02/06/2012**

Subject Name: Integrated Circuits and Applications

Time: 02:30 pm – 05:00 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)** Explain all the three open loop Op-Amp configurations. **06**

(b) Consider the Sallen Key low pass circuit for gain K=1, which is to be designed to realize a pair of poles at the angles ±Ψ with respect to negative real axis of S plane. If R_1=R_2=1, show that $Cos\psi = \sqrt{C_1/C_2}$. **04**

(c) Draw the high frequency model of an Op-Amp and Obtain the expression for the open loop gain as a function of frequency. **04**

Q.2 **(a)** Define slew rate of an Op-Amp .What are its causes? **03**

(b) Derive the expression for the closed loop voltage gain, input resistance and output resistance of voltage series feedback amplifier. **07**

OR

(b) Implement an integrator using Op-Amp. Obtain the expression for the output voltage V_0.Sketch the output waveform for an input square waveform. Show the frequency response of an ideal and a practical integrators **07**

(d) Define the following parameters of Op-Amp: **04**

(i) Input bias current
(ii) Common Mode Rejection ratio
(iii) Supply Voltage rejection ratio.
(iv) Output offset voltage

Q.3 **(a)** Explain the working of a Voltage to Current converter with floating load. Illustrate the application of this circuit as a Zener diode tester. **07**

(b) Show how Op-Amp can be used as an averaging,summing amplifiers using noninverting configuration. **04**

(c) State the properties of Butterworth filter **03**

OR

Q.3 **(a)** Explain the application of Op-Amp as : **07**

(i) Peaking Amplifier (ii) Schmitt Trigger

(b) Explain the operating principle of a Phase Locked Loop. **07**

Q.4 **(a)** Explain with a neat circuit diagram and waveforms,the operation of a monostable multivibrator using 555 timer . **04**

(b) Determine the following for the low pass specifications below: **08**

α_{max}=0.5 dB,α_{min}= 30 dB.ω_p=1000 rad/s,ω_s=2330 rad/s.

(a) The order of the filter 'n'
(b) S plane location of the poles
(c) Q of each pole.
(d) ω_0

(c) Name the different types of voltage regulators **02**

OR

Q.4	**(a)**	Draw the circuit diagram of triangular waveform generator and explain the operation with necessary equations and waveforms.	**07**
	(b)	Show how four Op-Amp Biquad circuit can be used as a universal filter. Derive the expression for the transfer function, and plot the magnitude response,pole-zero locations for all types of filter.	**07**
Q.5	**(a)**	Draw and explain the block diagrams of (i) Operational amplifier (ii) 555 timer	**08**
	(b)	For an astable multivibrator using 555 Timer, R_A=4.7KΩ, R_B=1KΩ,and C=.05μF,determine the positive pulse width, negative pulse width and the free running frequency.	**06**
Q.5	**(a)**	Using LM 317, design an adjustable voltage regulator to satisfy the specifications :V_0=10 to 15 volts,I_0=0.5A,Choose R_1=200Ω.Neglect I_{Adj}	**04**
	(b)	Draw the Deliannnis –Friend circuit and derive the transfer function. Express ω_0 ,bandwidth and Q in terms of circuit parameters.	**06**
	(c)	Discuss the attenuation characteristics of ideal and practical low pass and bandpass filters	**04**

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