

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-V (OLD) - EXAMINATION – SUMMER 2018**

**Subject Code:151003**

**Date:04/05/2018**

**Subject Name:Integrated Circuits and Applications**

**Time:02:30 PM to 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)** Draw and explain the block diagram of Op-Amp. List important characteristics of an op amp **07**
- (b)** Which type of feedback is used in inverting op-amp? Derive exact expressions for voltage gain, input resistance, output resistance and bandwidth for inverting op-amp. **07**
- Q.2 (a)** Consider an inverting operational amplifier with  $R_F=100K\Omega$  and  $R_1=1K\Omega$ . Input offset voltage drift is  $30\mu V/^\circ C$  and input offset current drift is  $300Pa/^\circ C$ . Assume the amplifier is nulled at  $25^\circ C$ . Calculate the value of error voltage  $E_v$  and output voltage at  $35^\circ C$  if  $V_{in}=1mV$  dc. **07**
- (b)** Draw & explain the basic differentiator circuit. What are the problems associated with it? Modify the circuit to obtain practical differentiator & prove that it solves the problem of basic differentiator circuit **07**
- OR**
- (b)** Explain the use of differential amplifier using three op-amps as instrumentation amplifier **07**
- Q.3 (a)** Explain the following application of op-amp (1) Small signal Half wave rectifier (2) Peak Detector **07**
- (b)** Draw basic log amplifier using a transistor. Derive the expression for output voltage **07**
- OR**
- Q.3 (a)** Explain the application of op-amp as a positive and negative clipper circuit. **07**
- (b)** Discuss operation of op-amp based saw-tooth wave generator circuit with relevant diagram and waveforms. **07**
- Q.4 (a)** Describe operation of each block of phase locked loop. List out PLL applications. **07**
- (b)** Draw Sallen-key low-pass filter circuit and obtain its transfer function. **07**
- OR**
- Q.4 (a)** What are the different types of voltage regulators? Discuss LM317 based adjustable voltage regulator. Indicate bypass capacitors to improve transient response and protective diodes in the connection diagram. **07**
- (b)** Explain working of 555 timer based monostable multivibrator. Design the same for the output pulse width of 10 ms. **07**
- Q.5 (a)** Classify filters with four basic types. Explain ideal and practical characteristics of all. Draw attenuation characteristics also. **07**
- (b)** Sketch Delyiannis-Friend circuit and obtain its transfer function. **07**
- OR**
- Q.5 (a)** For the following set of Butterworth LPF specifications.  $\alpha_{max} = 0.5$  dB ,  $\alpha_{min} = 20$  dB,  $W_p = 1000$  rad/sec,  $W_s = 2000$  rad/sec Determine : (1) Order of Butterworth LPF (2) Pole locations and corresponding  $Q_s$  (3) Half Power frequency **07**
- (b)** List the applications of Operational transconductance amplifier. Explain its application as a current controlled Integrator **07**

\*\*\*\*\*