

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (OLD) - EXAMINATION – SUMMER 2017****Subject Code: 151003****Date: 05/05/2017****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 two op-amp based differential amplifier and derive expression for its gain, input and output resistances, and bandwidth. **07**
- (b) Explain working of op-amp based Schmitt trigger circuit along with schematic and input/output waveforms. **07**
- Q.2** (a) Describe the operation of differential instrumentation amplifier which uses resistive transducer in a bridge circuit. Show that the output voltage is directly proportional to the change in resistance value of a transducer. **07**
- (b) Design four input amplifier such that $V_o = V_A - V_B + V_C - V_D$. **07**
- OR**
- (b) (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 $\pm 15V$. Draw input and out waveforms. **04**
- (ii) Define following terms for op-amp: (a) CMRR, (b) SVRR, (c) Slew Rate **03**
- Q.3** (a) Illustrate operation of op-amp based triangular wave generator circuit with necessary waveforms as well as mathematical steps. **07**
- (b) Classify filters with four basic types. Explain ideal and practical characteristics of all. Draw attenuation characteristics also. **07**
- OR**
- Q.3** (a) With the help of a circuit diagram explain the operation of first order high pass filter. **07**
- (b) Explain voltage to current converter with floating load. Based on that show low voltage dc voltmeter circuit and discuss it. **07**
- Q.4** (a) Explain how op-amp can be used as a differentiator. Discuss the sources of error. Draw and explain practical differentiator circuit. **07**
- (b) Design a Biquad bandpass filter with a center frequency of $\omega = 1000$ rad/s and a bandwidth of 200 rad/s. The midband gain $H = 1$. **07**
- OR**
- Q.4** (a) Draw the circuit of basic integrator using an op-amp. What are the problems associated with this configuration? How they are overcome? **07**
- (b) Draw and explain working of op-amp based full-wave rectifier circuit. How is it better in performance compared to full-wave rectifier circuit without op-amp? **07**
- Q.5** (a) Draw circuit diagram of an astable multivibrator using IC 555 and explain its operation. Derive expression for frequency of operation and duty cycle. **07**
- (b) 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**
- OR**
- Q.5** (a) Explain working of 555 timer based monostable multivibrator. Design the same for the output pulse width of 30 ms. **07**
- (b) Describe the working principle of phase-locked loop with basic blocks. Discuss its application as a frequency multiplier. **07**
