



FOURTH SEMESTER B. TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATION APRIL - 2018

SUBJECT: ANALOG SYSTEM DESIGN [ICE 2204]

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

- 1A. Draw and discuss current mirror circuit.
- 1B. Define input bias current. Explain with respect to inverting amplifier how the effect of input bias current is reduced.
- 1C. Define slew rate. What are its causes?
- 1D. What are the limitations of an ordinary differentiator? Draw and explain the circuit of practical differentiator that will eliminate them. (2+3+2+3)
- 2A. What are the desirable characteristics of an instrumentation amplifier? Draw an instrumentation amplifier with variable voltage gain and derive the expression for output voltage.
- 2B. Design a 3rd order Butterworth BPF with pass band between 3kHz to 20kHz and pass band gain of 10. 3rd order Butterworth polynomial can be factorized as $(s+1)(s^2+s+1)$.
- 2C. A square wave of $\pm 1V$ and frequency 10Hz is applied to ideal integrator. Assuming $RC = 1\text{sec}$. and no initial voltage on the integrator, plot output voltage of integrator. (4+4+2)
- 3A. Design an inverting type Schmitt trigger circuit with $UTP = 3V$ and hysteresis of 4V. OPAMP saturation voltage is $\pm 12V$. Draw the circuit diagram.
- 3B. Write the circuit of OPAMP based square wave generator and derive the expression for frequency of oscillations.
- 3C. Design a circuit to generate a pulse of duration 5msec and amplitude -15V. Draw the circuit diagram. (4+4+2)
- 4A. Design a square wave generator for 1KHz with 60% duty cycle and amplitude 0 to 8V. Write the circuit diagram.
- 4B. With help of block diagram explain working principle of PLL.
- 4C. With the circuit diagram derive expression for frequency of oscillation of Wein Bridge oscillator. (4+3+3)
- 5A. Design Colpitt's oscillator using OPAMP to generate 200 kHz signal. Draw the circuit diagram.
- 5B. With the help of block diagram and relevant timing diagram explain dual slope type Analog to Digital conversion principle.
- 5C. An 8 bit DAC has a resolution of 10mV. Find the full scale output and the voltage when the binary input
- 5D. List the drawback of binary weighted resistor DAC. (2+4+2+2)