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Manipal Institute of Technology, Manipal





III SEMESTER B.TECH (MECHATRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2015

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS [MTE-2104]

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL FIVE FULL the questions.
- ✤ Missing data may be suitably assumed.
- **1A.** Derive the expression for closed loop voltage gain and output impedance of a **(5)** practical Non-Inverting amplifier.
- **1B.** With a neat diagram elaborate on the working of Window Detector that has (3) low output between the limits.
- 1C. Identify the circuit shown in Fig.1(C) and calculate the output frequency of (2) oscillation.



- **2A.** Design a 2^{nd} order filter which has its pass band between 400Hz and 2kHz. (4) Assume C = 0.01µF.
- 2B. Elucidate the working of a Successive Approximation ADC with the help of a (4) 4 bit digital word. Also show the process of approximation for 0000 1111
- **2C.** Calculate the output voltage of the circuit shown in **Fig. 2(C)**. (2)



- **3A.** With the neat diagram explain working of a Ramp Generator using IC 555 (5) and derive the expression for time period. Design a linear ramp generator which has following specifications: Frequency of oscillation = 1kHz, $V_{cc} = 5V, R_1 = 10k\Omega, R_E = 2.7K\Omega, C = 0.1\mu F$
- 3B. Design an adjustable Voltage Regulator using IC 7805 that gives variable (3) output voltage from +5V to +8V. Assume negligible quiescent current and 25mA through resistance R1 (connected to terminal 2).
- **3C.** Calculate the gain of the circuit shown in **Fig. 3(C)**.



- 4A. Design a timer using IC 555 to generate a square wave of free running (4) frequency, 20kHZ with 75% duty cycle. The output of this timer is to be connected to a digital counter for 2s automatically after every 2s.
- 4B. Design a Voltage Controlled Oscillator with an output frequency 2kHz and (4) modulating input voltage 9V. Calculate the threshold resistance. Also calculate the variation in frequency if the modulating voltage is varied from 7.8V to 9.6V. Draw the output if the modulating input is a sine wave. Assume one of the resistances in the voltage divider network as 10kΩ. Vcc = +10V.Assume all capacitors to be 0.01µF.
- **4C.** Explain how PLL can be used for frequency translation? (2)
- **5A.** Design an Inverting Schmitt trigger using Op-amp with the following (5) specifications. UTP=3V, LTP=4.5V, output swings between $\pm 10V$. If the input is 5cos ω t, plot the waveforms of input and output.
- 5B. A digital code is to be transmitted using 2 frequencies over a distance. All 0s (3) are sent using 1070Hz and all 1s are sent using 1270Hz. Identify a suitable circuit and design the same using IC 555
- **5C.** Design a circuit for simple fading LED using IC 555. (2)

(2)