ROLL NO. _____

Code: AE54/AC54/AT54 **Subject: LINEAR ICs & DIGITAL EL... ICS**

AMIETE – ET/CS/IT (NEW SCHEME)

Time: 3 Hours **DECEMBER 2011** **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions, selecting at least TWO questions from each part, each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: **(2×10)**

a. The bandwidth of an ideal Op-Amp is

(A) 0 **(B)** 1MΩ
(C) ∞ **(D)** 80KΩ

b. If the change in voltage is $\Delta V = 2.4V$ and rise time $4\mu s$ then slew rate of the Op-Amp is

(A) $0.4\,V/\mu s$ **(B)** $0.5\,V/\mu s$
(C) $0.1\,V/\mu s$ **(D)** $0.6\,V/\mu s$

c. The output voltage of an Op-Amp integrator is

(A) $V_o(t) = -R_1 C_f \int V_i(t)dt$ **(B)** $V_o(t) = -R_1 \int V_i(t)dt$

(C) $V_o(t) = -\frac{1}{R_1 C_f}\int V_i(t)dt$ **(D)** $V_o(t) = \int V_i(t)dt$

d. The output frequency of a triangular wave generator is given by

(A) $f_o = \frac{R_1 R_3}{4R_2 C_1}$ **(B)** $f_o = \frac{R_3}{4R_1 C_1 R_2}$

(C) $f_o = \frac{1}{4R_1 R_2 R_3 C_1}$ **(D)** $f_o = \frac{R_2}{4R_1 R_3 C_1}$

e. The equivalent weight of the LSB in a 4 bit variable resistive divider DAC is

(A) $\frac{1}{4}$ **(B)** $\frac{1}{16}$

(C) $\frac{1}{15}$ **(D)** $\frac{1}{32}$

f. An XOR gate gives a high output

(A) if there are odd number of 1's in input.
(B) if there are odd number of 0's in input.
(C) if there are even number of 1's in input.
(D) if there are even number of 0's in input.

g. For checking the parity of a digital word, it is preferable to use

(A) AND gates **(B)** NAND gates
(C) EXOR gates **(D)** NOR gates

h. The maximum number of binary states that a counter can have if it uses 8 FlipFlops is

(A) 8 **(B)** 16
(C) 64 **(D)** 256

i. To obtain 10 KHz square wave from 1 MHz clock, ÷by counter to be used is

(A) ÷by 10 counter **(B)** ÷by 100 counter
(C) ÷by 1000 counter **(D)** ÷by 1 counter

j. What will be the output voltage of a 6 bit binary ladder DAC with input 101001 if V(0) = 0 and V(1) = 10 V

(A) 6.41V **(B)** 0.0156V
(C) 6.4V **(D)** 4.1V

PART (A)
Answer At least TWO questions. Each question carries 16 marks.

Q.2 a. Derive the output expression for a differential amplifier using Op-Amp. Using the same, derive the expression for CMRR of the differential amplifier. **(4+4)**

b. Explain the method of frequency compensation using dominant pole compensation method. **(8)**

Q.3 a. A square wave of frequencies 100 Hz, 10 KHz and 1MHz are applied as input to an Op-Amp voltage follower. The Op-Amp has a slew rate of $1V/\mu s$. Show the output waveforms for these 3 cases & explain. **(8)**

b. Explain the operation of a precision full wave rectifier with waveforms. **(8)**

Q.4 a. In an Op-Amp Schmitt trigger circuit $R_2 = 110K\Omega$, $R_1 = 60K\Omega$, $V_{ref} = 2V$ $V_i = 1V\,pp$ sinewave saturation voltage = $\pm 15V$. Determine the threshold voltages V_{LT} & V_{UT}. **(8)**

b. Draw a sample and hold circuit. Explain its operation and indicate its uses. **(8)**

Q.5 a. (i)Draw the diagram and explain the operation of a fixed regulator used as adjustable regulator.
(ii)Using the above circuit with IC 7805, design for $V_o = 7.5V$, $I_Q = 4.2mA$, $V_R = 5V$, $I_{R1} = 25mA$. **(4+4)**

b. (i) Explain the operation of R-2R ladder DAC.
(ii) Calculate the output voltage for 10000000_2 for R-2R ladder DAC $R_F = R = 5K\Omega$ for a reference voltage of 5V. **(4+4)**

PART (B)
Answer At least TWO questions. Each question carries 16 marks.

Q.6 a. Perform the following:
(i) Add 120 with -55 in 2's complement method.
(ii) Subtract -68 from -15 in 2's complement.
(iii) $(24.6)_{10} = (\ )_2$
(iv) $(0.640625)_{10} = (\ )_8$
(v) $(0.582)_H = (\ )_{10}$
(vi) $(574)_8 = (\ )_2$ **(8)**

b. Perform the following BCD addition:
(i) 175 + 326 (ii) 589 + 199 **(8)**

Q.7 a. Simplify the given Boolean expression using Boolean theorems and implement using basic gates.

(i) $AB + \overline{AC} + A\overline{B}C(AB + C)$
(ii) $XY + XYZ + XY\overline{Z} + \overline{X}YZ$ **(6)**

b. Reduce the following function using K map technique

(i) $f(A, B, C, D) = \sum m(0,1,4,8,9,10)$ **(4)**

(ii) Draw the gate level diagram to 4:1 MUX. Draw the truth table and the output expression. **(6)**

Q.8 a. What is an encoder? Draw and explain the truth table of an octal to binary encoder. **(8)**

b. Explain clocked SR FlipFlop with the help of truth table and diagram. Convert the same into and clocked D FlipFlop and explain its working. **(8)**

Q.9 a. Write short notes on:-

(i) Johnson counter or Twisted ring counter. **(6)**

(ii) 3 bit synchronous binary counter. **(6)**

b. (i) A counter has 14 stable states 0000 through 1101. If the input frequency is 50 KHz, what will be its output frequency. **(2)**

(ii) The propagation delay time t_{pd} for each flip flop is 50ns. Determine the maximum operating frequency for mod 32 ripple counter. **(2)**