ROLL NO. _____

Code: AE54/AC54/AT54 Subject: LINEAR ICs & DIGITAL ELECTRONICS

AMIETE – ET/CS/IT

Time: 3 Hours **DECEMBER 2012** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **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. In an ideal Op-Amp open-loop voltage gain is

(A) Zero **(B)** Infinite
(C) Larger **(D)** Medium

b. Military grade op-amp temperature range is

(A) 0°C to 70°C **(B)** -55°C to 125°C
(C) 0°C to 27°C **(D)** -27°C to $+40^\circ$C

c. The main purpose of the difference amplifier in op-amp is

(A) Better CMRR **(B)** Better gain
(C) Noise cancellation **(D)** All of these

d. The current to voltage converters are called as

(A) Transconductance Amplifier **(B)** Transresistance Amplifier
(C) Transadmittance Amplifier **(D)** Converters

e. Calculate phase-shift oscillator oscillating frequency if R=6.49 KΩ and C=0.1 μF

(A) 110 Hz **(B)** 100 Hz
(C) 10 Hz **(D)** 0.1 Hz

f. The 555 timer can be used with supply voltage range of

(A) ± 5 V **(B)** +5 V to +18 V
(C) ± 18 V **(D)** –5 V to –18 V

g. Which one of the following is a digital quantity?

(A) Current-flowing out of an electric outlet
(B) Ten-position switch
(C) Temperature of a room
(D) Automobile speedometer

h. How many bits are needed to represent decimal values ranging 0 to 12,500?

(A) 16 **(B)** 14
(C) 10 **(D)** 8

i. Simplified expression of $y = A\,\overline{B}\,D + A\,\overline{B}\,\overline{D}$ is

(A) 1 **(B)** AB
(C) $A\,\overline{B}$ **(D)** $\overline{B}\,D$

j. Simplified expression of $z = \overline{(\overline{A} + C).(B + \overline{D})}$ is

(A) 1 **(B)** $AB + \overline{B}\,D$
(C) $A\overline{C} + \overline{B}\,D$ **(D)** $AC + \overline{B}\,D$

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

Q.2 a. List the advantages of integrated circuits over discrete component circuit. **(6)**

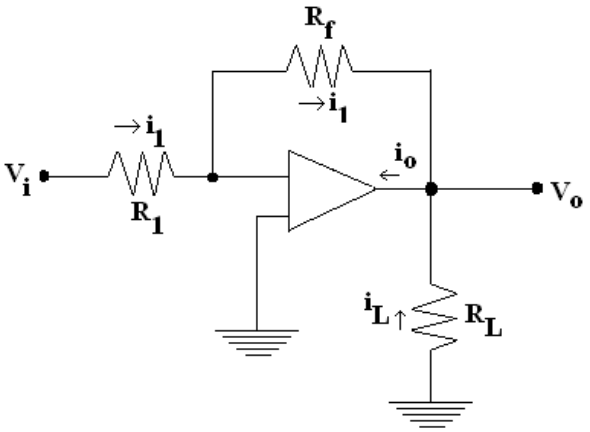

Fig. 1

b. In Fig.1, given R_1 = 10 kΩ, R_f =100 kΩ, V_i = 1 V, a load of 25 kΩ is connected to the output terminal. Calculate
(i) i_1 (ii) v_o
(iii) i_L and i_o **(6)**

c. Draw an AC equivalent circuit of Fig. 2 using hybrid-Π model. **(4)**

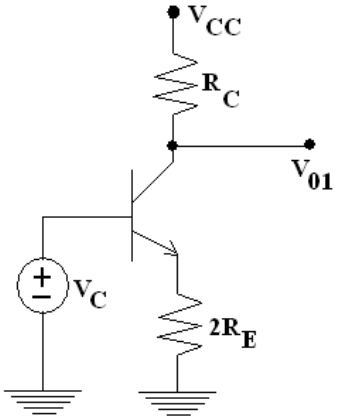

Fig. 2

Q.3 a. For the non-inverting amplifier of Fig. 3, $R_1 = 1\,k\Omega$ and $R_f = 10\ k\Omega$. Calculate the following:

(i) The maximum output offset voltage due to V_{OS} and I_B. The opamp is LM307 with V_{OS}=10 mV and I_B=300 nA and I_{OS}=50 nA.

(ii) The value of R_{comp} needed to reduce the effect of I_B.

(iii) The maximum output-offset voltage if R_{comp} as calculated in (ii) is connected in the circuit. **(8)**

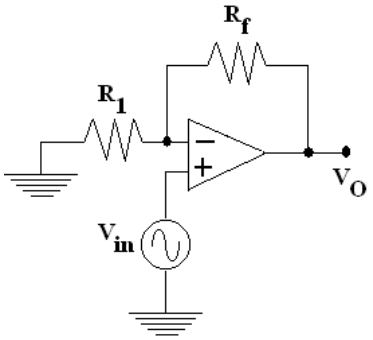

Fig. 3

b. With the needful diagram show the difference between V to I and I to V converter. **(8)**

Q.4 a. Draw the positive peak-detector circuit and explain its working operation. **(8)**

b. In Fig.4, show that $V_o = \frac{1}{RC}\int V_i.dt$. **(8)**

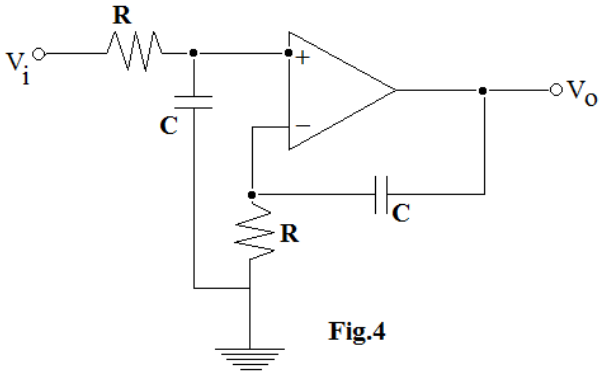

Fig.4

Q.5 a. Explain the working of Successive Approximation Analog to Digital Converter. **(8)**

b. Explain Astable-multivibrator circuit operation using 555 timers. **(8)**

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

Q.6 a. What are the advantages of digital techniques over analog? **(6)**

b. A small process control uses octal codes to represent it's 12-bit memory addresses.
(i) How many octal digits are required?
(ii) What is the range of addresses in octal?
(iii) How many memory locations are there? **(4)**

c. Convert the following:
(i) 0 1 1 1 1 1 0 0 0 0 0 1 (BCD) to decimal
(ii) $B2F_{16}$ to octal
(iii) 378_{10} to hexa. **(6)**

Q.7 a. Determine the output in Fig.5, for the condition A=0, B=1, C=1 and D=1. **(4)**

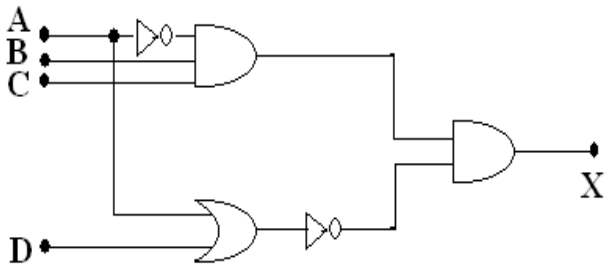

Fig. 5

b. Implement INVERTER, AND and OR gates using NAND and NOR-gates. **(8)**

c. Simplify the expression $X = (\overline{A} + B)(A + B + D)\overline{D}$ **(4)**

Q.8 a. Explain the design procedure of full adder. **(8)**

b. Write a short note on Demultiplexers. **(8)**

Q.9 a. Draw and explain the NOR-gate latch working operation. **(8)**

b. Design four-bit ring counter using D flip-flops. **(8)**