ROLL NO. _____

Code: AC103/AT103 Subject: ANALOG AND DIGITAL ELECTRONICS

AMIETE – CS/IT *{NEW SCHEME}*

Time: 3 Hours **JUNE 2014** **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. The material used for forming N-type semiconductor is

(A) Boron **(B)** Arsenic
(C) Aluminium **(D)** Gallium

b. The forward voltage drop across an ideal diode is

(A) 0.3 V **(B)** 0.7 V
(C) 0.0 V **(D)** Infinity

c. The voltage V_0 in the circuit shown below is ($V_Z = 9V$ and $I_{ZT} = 20mA$)

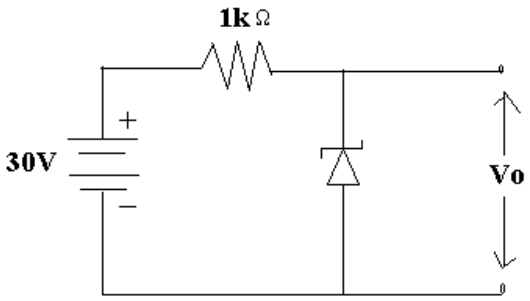

Fig.1

(A) 30 V **(B)** 9 V
(C) 10 V **(D)** 20 V

d. The value of I_C for a silicon transistor that has an $\alpha_{DC} = 0.98$ and $I_B = 100\mu A$ is

(A) 4.9 mA **(B)** 5.4 mA
(C) 3.9 mA **(D)** 5.9 mA

e. The value of closed loop voltage gain for the negative feedback amplifier with open loop gain $A_o = 100000$ and $\beta = \frac{1}{100}$ is

(A) 90 **(B)** 99
(C) 99.9 **(D)** 102.3

f. $(423)_{10} = (\ )_{16}$

(A) 1A7 **(B)** 117
(C) 1107 **(D)** 2A7

g. $x + \bar{x}y =$

(A) x **(B)** x + y
(C) $\bar{x} + y$ **(D)** $x + \bar{y}$

h. In a K-map, looping an octet of adjacent 1s eliminates

(A) One variable **(B)** Two variables
(C) Three variables **(D)** Four variables

i. 2's complement of 101101 is

(A) 010011 **(B)** 010010
(C) 100010 **(D)** 011100

j. In a Mod-16 counter, the output from the last flip-flop will have a frequency of _____ of the input frequency

(A) Half **(B)** One fourth
(C) One eighth **(D)** One sixteenth

PART (A)
Answer at least TWO Questions. Each question carries 16 marks.

Q.2 a. Explain the formation of N-type and P-type semiconductors. **(4)**

b. Explain the forward and reverse characteristics of a PN junction diode. **(6)**

c. Calculate the resistivity of Si at 300K. If donor impurity to the extent of 1 part of 10^8 atoms of Si is added. Find the density of minority carriers and the resistivity. **(6)**

Q.3 a. Draw the circuit of bridge rectifier & explain its working with the waveforms. Also obtain the expression of its PIV and conversion efficiency. **(8)**

b. Draw the circuits of series clipping circuits and explain its working with waveforms. **(8)**

Q.4 a. Explain the operation of NPN transistor with neat diagrams and also discuss, its operating modes and applications. **(8)**

b. Draw the circuit of collector to base bias and explain. Also obtain the expression of its stability factor. **(8)**

Q.5 a. Explain the capacitor coupled two stage CE amplifier with a neat circuit diagram. **(8)**

b. Explain the effect of negative feedback on Input Impedance, Output Impedance and bandwidth of voltage series and current shunt feedback amplifier. **(8)**

PART (B)

Answer at least TWO Questions. Each question carries 16 marks.

Q.6 a. What are the advantages and limitations of digital techniques? **(4)**

b. Explain BCD code and compare it with binary code. **(4)**

c. Perform the following conversions:

(i) $(1001.101)_2 = (\ )_{10}, (10101)_2 = (\ )_{16}$

(ii) $(-42)_{10} = (\ )_{10}$

(iii) $(4FF)_{16} = (\ )_8$ **(4)**

d. What are gray codes? Discuss its properties and applications in digital systems. Convert $(11101)_2$ into gray code. **(4)**

Q.7 a. Explain the universality of NAND and NOR gates. **(4)**

b. Simplify the expression $y = \overline{C}(\overline{A}\overline{B}\overline{D} + D) + A\overline{B}C + \overline{D}$ using Karnaugh map. **(8)**

c. Implement two input XOR using four NAND gates only. **(4)**

Q.8 a. Draw the block diagram of a 5 bit parallel adder circuit and explain. **(4)**

b. What is a Decoder? Explain with a diagram the working of a 3 line to 8 line decoder. **(8)**

c. Implement full subtractor using 3×8 multiplexers. **(4)**

Q.9 a. Explain the working of a clocked D flip flop with neat diagram and waveforms. Implement T flip-flop using D flip-flop. **(8)**

b. Draw the diagram of a Mod-8 Counter and explain its working with waveforms. **(8)**