ROLL NO. ______________

Code: DE58/DC58 **Subject: LOGIC DESIGN**

DipIETE – ET/CS

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. 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 binary equivalent of $(19.75)_{10}$ is ________

(A) 00011001.111101 **(B)** 10011.110
(C) 11001.11101 **(D)** 001110.110

b. The octal equivalent of decimal number 105 is __________

(A) 151 **(B)** 410
(C) 1101001 **(D)** 0010001001

c. The decimal equivalent of $(101101)_2$ is _______

(A) 55 **(B)** 71
(C) 27 **(D)** 45

d. Which gate is used if an event will be successful if all the input conditions are satisfied __________

(A) OR **(B)** AND
(C) NOT **(D)** EX OR

e. A Flip Flop with four NAND gates can store _________

(A) four bit of data **(B)** two bit of data
(C) one bit of data **(D)** De-multiplexer

f. A 8 bit data from a microprocessor can be transferred on a single wire using __________

(A) ripple counter **(B)** shift register
(C) serial adder **(D)** counter

g. A Schmitt trigger gate helps in _________

(A) removing area of uncertainty **(B)** wave shaping
(C) trigger counters **(D)** storing 1 bit of data

h. RAM is generally a _________

(A) permanent memory **(B)** volatile memory
(C) non volatile memory **(D)** magnetic memory

i. The address lines in a 64 K, 16 bit memory are _______

(A) 8 **(B)** 12
(C) 32 **(D)** 64

j. A diode encoder is equivalent to a ________

(A) RAM **(B)** ROM
(C) GATE **(D)** Multiplexer

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. With the help of functional diagram explain all the units of a digital computer. **(6)**

b. What is the need of error detecting codes? Explain briefly how errors can be detected with the help of example. **(6)**

c. Convert $(234)_{10}$ into Hex code. **(4)**

Q.3 a. Design a system using Universal Gates that can be used to control a lift. The lift door should open only at 2^{nd} ,3^{rd} ,5^{th} and 7^{th} floors. **(8)**

b. Simplify the following expressions using K-map: **(8)**
(i) $F = \sum m(1,5,8,12) + d(6,10,14)$ and
(ii) $F = AB'C'D' + AB'CD + ABCD + ABCD' + A'B'CD'$

Q.4 a. Define the following referred to Flip-Flops: **(6)**
(i) State on Power up
(ii) Setup and Hold times
(iii) Clocked input

b. What is meant by propagation delay? How does it effect an asynchronous data transfer system performance? Give an example. **(4)**

c. Construct the following from Using JK Flip-Flop:
(i) T Flip Flop
(ii) Master Slave Flip Flop
(iii) Single bit Latch **(6)**

Q.5 a. What are Signed and Unsigned numbers, how are these represented in binary system? **(4)**

b. Implement a Full Adder using two Half Adders composed of basic gates. Verify your design by adding A=1, B=0 and $C_{in} = 1$ **(4)**

c. Design a 4bit Adder that can also perform as a subtractor, show that your design works satisfactorily. **(8)**

Q.6 a. A 4 bit ripple counter is operated at a clock of 10 MHz, if the propagation delay of each Flip Flop is 20 nsec, evaluate whether the counter will respond or not. What is the output frequency. If this were to be a synchronous counter with two gates of delay 10 nsec each, what will be the maximum operating frequency. **(8)**

b. Design a mod 12 Synchronous Counter and draw the timing diagram to verify your result. **(8)**

Q.7 a. Distinguish between a decoder and an encoder; give one example of each of these. **(4)**

b. Realize the following using 4×1 multiplexers. **(6)**

$$Y_1 = AS_1S_2 + B'S'_1S_2 + CS_1S'_2$$

$$Y_2 = A'S'_1S_2 + B'S'_1S'_2$$

c. What is the concept of a Magnitude Comparator, give a typical example of such comparator. **(6)**

Q.8 a. What is the role of memory during the CPU operation? **(4)**

b. What is Flash memory, how is it different from SRAM? **(6)**

c. Draw the architecture of a RAM and explain how data is written and read from the various memory locations. **(6)**

Q.9 Write short notes on: **(2×8)**

(i) Shift register counter.
(ii) Decoding a counter.