

Roll No. ....

**67008**

**MCA 1st Semester (Current) CBCS**

**Scheme w.e.f. Dec - 2016**

**Examination – November, 2017**

**DIGITAL DESIGN**

**Paper : MCA-103(C)**

**Time : Three Hours ]**

**[ Maximum Marks : 80**

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt *five* questions in all by selecting *one* question from each Unit and Q. No. 1 is *compulsory*.

1. (a) What are Self-Complementing Codes ?  $8 \times 2 = 16$
- (b) Why 2's complement is preferred in computers ?
- (c) What are PLAs ?
- (d) Differentiate between Edge-triggered and Level-triggered flip-flops.
- (e) What are race-conditions ?
- (f) What is a Johnson-Counter ?

(g) Differentiate between NMOS and PMOS logic families.

(h) What is a Buffer Register ?

### UNIT - I

2. (a) What are Error-Detecting and Error-Correcting Codes ? Illustrate their usefulness with suitable examples. 6

(b) Perform  $(-25)_{10} \times (-15)_{10}$  using Booth Coding representation and justify the result. 5

(c) Perform the following binary arithmetic operations using 2's complement representation:

(i)  $(35)_{10} + (-12)_{10}$

(ii)  $(-15)_{10} + (-32)_{10}$  5

3. (a) What are Cyclic codes ? How are these useful ? Illustrate. 6

(b) What is the minimum and maximum integer and floating-point number stored in a 64-bit register assuming 1 bit as a sign-bit, 16 bits for exponent and rest of the bits for significant? Provide its complete layout indicating overflow and underflow regions. 6

(c) Perform the following : 4

(i) Convert  $(128)_{10}$  into Excess-3 code

(ii) Convert  $(11101011101)_2$  to Gray code.

## UNIT – II

4. (a) What are Universal Gates ? How Universal gates are realized into basic gates ? Illustrate. 6
- (b) What is Boolean Expression ? Simplify the following Boolean expression : 10
- $$F(a, b, c, d) = \sum m (1, 3, 4, 5, 9, 10, 11) + \sum d (6, 8)$$
- in canonical SOPs and POSs and implement one of these using basic gates.
5. (a) What do you mean by the following terms ? 6
- (i) Noise Margin
  - (ii) Propagation delay
  - (iii) Fan-in and Fan-out
- Illustrate their relevance.
- (b) What is a Logic family ? What criteria make one logic family to differ from another ? Differentiate between TTL and CMOS Logic families. 10

## UNIT – III

6. (a) What is Magnitude Comparator ? Design 2-bit Magnitude Comparator. 8
- (b) What is combinational circuit ? Design a combinational circuit that receives 4-bit binary number as input and produces its 2's complement at its output. 8

7. Illustrate the purpose of the following and implement :

- (a) Code Converter 8
- (b) Master-Slave Flip-Flop 8

#### UNIT – IV

8. (a) What do you mean by controlled shift registers? Design a 3-bit controlled shift register and illustrate its working. 8
- (b) What is a BCD Counter ? How will you design it ? Illustrate. 8
9. (a) What is dynamic RAM ? How is it different from Static RAM ? Under what circumstances each of these preferred and why ? Explain. 8
- (b) What is a ripple counter ? How is it different from synchronous counter ? Design a ripple counter and discuss its working. 8