53 (EC 401) DGEL

2017

DIGITAL ELECTRONICS

Paper : EC 401 (Back)

Full Marks : 100

Time : Three hours

**The figures in the margin indicate
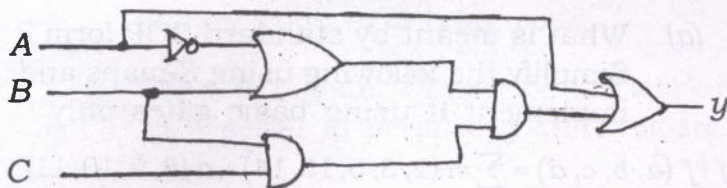full marks for the questions.**

*Answer **any five** questions.*

1. *(a)* Convert the following decimal numbers to Gray code and excess-3code.

   (i) $(102)_{10}$ *(ii)* $(145)_{10}$ 4

   (b) State and prove De Morgan's theorem.

   4

   (c) For the logic circuit shown below, answer the following :

   (i) Find out the expression for y and simplify.

(ii) Draw the truth table.

(iii) Implement the simplified logic circuit using NAND gates only.

6

(d) Simplify the following Boolean expressions : 3+3=6

(i) $Y = ABCD + ABC\overline{D} + \overline{A}BCD + \overline{A}BC\overline{D}$

(ii) $[A\overline{B}(C + BD) + \overline{A}\overline{B}]C$

2. (a) What is parity generator ? Design a combinational logic circuit with four input variables that will produce logic I output when the number of 'I' in input is even. 2+4=6

(b) Design a 2-bit comparator using gates.

6

(c) Design a full subtractor and explain its operation. 6

(d) What is binary decoder ? 2

3. (a) What is meant by standard SOP form ? Simplify the following using K-maps and implement it using basic gates only

(i) $f(a, b, c, d) = \sum m(2, 3, 5, 13, 14) + d(8, 9, 10, 11)$

(ii) $f(P, Q, R, S) = \Pi M(1, 2, 3, 8, 10, 12, 13, 14, 15)$

2+5+5=12

(b) What is Multiplex ? Implement a full adder using two 4:1 MUX. 2+6=8

4. (a) Differentiate between sequential and combinational circuits. 4

(b) Draw a neat logic diagram of clocked J-K flip-flop using NAND gates and explain its operation. 6

(c) An S-R flip-flop is connected as shown in fig. below. Determine the Q output in relation to the clock. What specific function does this device perform ?

6
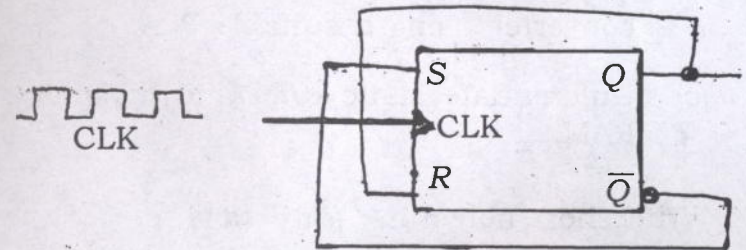
(d) Design a logic circuit converts a 3 bit binary code to a Gray code. 4

5. (a) What is register ? Describe the working of a serial in serial out shift register. 2+4=6

(b) Design and implement a Mod-5 synchronous counter using J-K flip-flop. 7

(c) Design a circuit to generate the sequence $0 \rightarrow 2 \rightarrow 4 \rightarrow 6 \rightarrow 3$.   7

6. (a) What is the difference between PLA and PAL ? Realize the following equations with a suitable PLA.   2+8=10

$$W(A, B, C) = \sum m(0, 1, 4)$$

$$X(A, B, C) = \sum m(0, 3, 4, 7)$$

$$Y(A, B, C) = \sum m(1, 2, 6)$$

$$Z(A, B, C) = \sum m(2, 3, 6, 7)$$

(b) Design a 3 bit Gray to binary code converter using a suitable PLA.   7

(c) Differentiate static RAM and dynamic RAM.   3

7. Write short notes on : *(any two)*

2×10=20

(i) Multiplexer and Demultiplexer

(ii) Programmable Logic Devices

(iii) Seven Segment Decoder.