53 (EC 401) DGEL

2014

DIGITAL ELECTRONICS

Paper : EC 401

Full Marks : 100

Pass Marks : 30

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-3 code.

   (i) $(126)_{10}$

   (ii) $(379)_{10}$ 4

(b) State and prove De Morgan's theorem. Write the Boolean equations for the circuits of *fig. 1(a)* & *fig. 1(b)*. Simplify the equations and draw the simplified logic circuit. 3+5=8

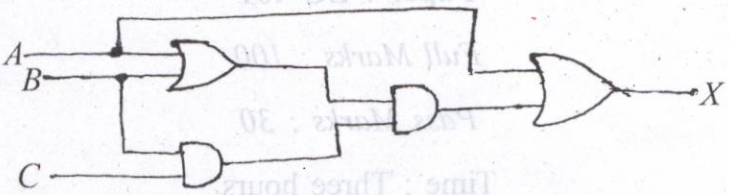

fig. 1(a)

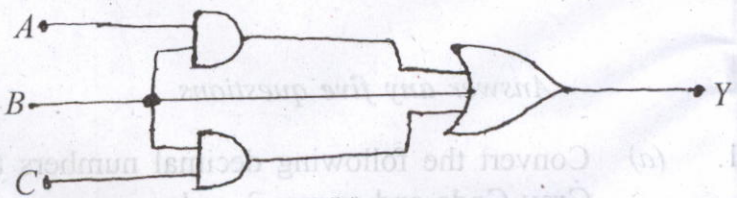

fig. 1(b)

(c) Describe the operation of Full adder and Full subtractor. 8

2. *(a)* Obtain the simplified expression in product of sums by 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) $F(P, Q, R, S) = \sum m(2, 3, 6, 7, 8, 9, 12, 13) + d\ (4, 10, 14)$ 10

(b) How does look ahead carry adder speed up operation of addition ? Explain 5

(c) Describe the operation of 3 line to 8 line decoder. 5

3. *(a)* Design the following code converters : ***(any two)*** 2×5=10

(i) BCD to XS-3

(ii) Gray to binary

(iii) BCD to sevensegment common anode.

(b) An *S-R* flip flop is connected as shown in *fig. (2)*. Determine the *Q* output in relation to the clock. What specific function does this device perform ? 4

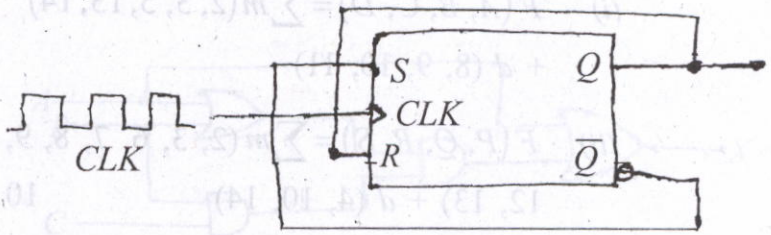

fig. (2)

(c) Describe the working of a *J-K* flip flop. How does it differ from *T* flip flop. 6

4. (a) Explain what you understand by a register. Describe the working of a serial in serial out shift register. 2+5=7

(b) Design a Mod-9 ripple counter using *J-K* flip flop and draw the output waveform. 7

(c) Design a circuit to generate the sequence $0 \rightarrow 1 \rightarrow 5 \rightarrow 4 \rightarrow 7 \rightarrow 3$ using *T*-flip flop. 6

5. (a) What is the difference between truth table and excitation table. Design and implement a Mod-6 synchronous counter using *J-K* flip flop. 3+7=10

(b) Convert the following flip flop 10

(i) *S-R* to *D* flip flop

(ii) *J-K* to *S-R* flip flop

6. (a) State the relative merits of static and dynamic RAMs. With suitable example, explain expanding the word size and word capacity of the memory. 5+10=15

(b) Design a $2K \times 8$ *bit* memory chip using $2K \times 4$ chips. 5

7. (a) Draw the Block diagram of PLA and explain the functions. 10

(b) What is the difference between PLA and PAL. Realize the following equations with suitable PLA. Draw the logic diagram using PLA. 2+8=10

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

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

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

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