53 (EC 401) DGEL

2012 C
2013
(May)

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)* Express the following decimal numbers in the XS-3 code. 3

   (i) 2515 *(ii)* 653

   (b) Minimize the following expression using K-map

   $Y(A, B, C, D) = \sum m\,(0, 1, 2, 3, 4, 5, 6, 7, 11, 13, 14)$ 5

(c) Design a 5-bit odd parity generator. Draw and explain the carry look-ahead adder. 5+7=12

2. (a) Design a 2-bit comparator using logic gates. 5

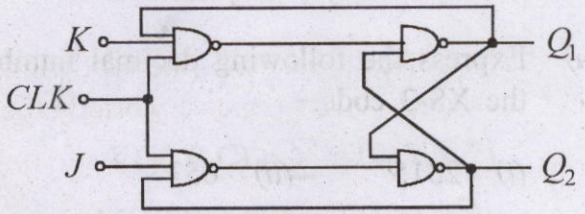
(b) What is multiplexer? Implement the following function using 8 : 1 MUX.

$$f(A, B, C, D) = \sum m(2, 4, 5, 7, 10, 14)$$

3+8=11

(c) Distinguish between combinational and sequential circuits. 4

3. (a) Identify Q and $\overline{Q}$ outputs of the clocked J-K flip-flop shown in figure below : 4



(b) Draw the logic circuit of J-K flip-flop using T-flip-flop. 6

(c) Design a MOD-5 synchronous counter using T-flip-flop. 10

4. *(a)* What is register ? Describe the working of a 4-bit SISO shift register and draw the waveforms of shift register for serial input. 3+7=10

(b) Design a sequential generator using J-K flip-flop to generate the sequence. 10

$$0 \rightarrow 2 \rightarrow 4 \rightarrow 5 \rightarrow 1 \rightarrow 7 \rightarrow 6$$

5. *(a)* For a memory with M words storage, find the number of pins required for addressing and range in binary format for each of the following cases.

(i) M = 64 *(ii)* M = 16 5

(b) State the relative merits of static and dynamic RAMs. 5

(c) State the full name of the following memory devices and describe very briefly the function of *each one.* 10

(i) ROM *(ii)* EPROM

6. *(a)* Explain CMOS inverter gate with a circuit diagram. 5

(b) Explain the basic ECL OR / NOR gate with a neat circuit diagram. Why does the ECL family have the lowest propagation delay of all logic families ? 10

(c) When does a TTL circuit act as a current source ? As a current sink ? 5

7. (a) Draw the block diagram of PLA and write the applications of PLA. 5

(b) Realize the following equations with a suitable PLA and draw the logic diagram using PLA.

(i) $f_1(A, B, C, D) = A\overline{B}D + \overline{A}B\overline{D}$

$f_2(A, B, C, D) = A + B\overline{D}$ 6

(ii) $W(A, B, C) = \sum m(0, 1, 4)$ 9

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

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

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