H 1232

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Fourth Semester

Electronics and Communication Engineering

EC 242 — DIGITAL ELECTRONICS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find the 2's complement and 1's complement of 101101.

2. Simplify $x_1 + x_1x_2$.

3. Write down the characteristics of NMOS logic gates.

4. Write about the WIRED–AND logic in open collector TTL NAND gate.

5. Find the standard sum for the following function

   $f = x_1x_2x_3 + x_1x_3x_4 + x_1x_2x_4$.

6. Draw a parity checker circuit for 3 bit binary word $x_1x_2x_3$.

7. What is a flip–flop?

8. Differentiate between edge–triggered flip–flop and level triggered flip–flop.

9. What is Race problem in flip–flops?

10. What are the classes of asynchronous sequential circuits?

PART B — ($5 \times 16 = 80$ marks)

11. Design a negative edge triggered T flip flop. The circuit has two inputs, T (toggle) and C (clock) and outputs Q and $\overline{Q}$. The output state is complemented if $T = 1$ and the clock C changes from 1 to 0. Otherwise under any other input condition, the output Q remains unchanged.

12. (a) (i) Prove the Demorgan's laws using Boolean algebra. (8)

(ii) Find the minimal sum of product form for the following switching function

$f(x_1, x_2, x_3, x_4, x_5) = \Sigma m\ (2, 3, 6, 7, 11, 12, 13, 14, 15, 23, 28, 29, 30, 31)$ (8)

Or

(b) Simplify the following Boolean expressions

(i) $(x_1 + x_2)(x_1' x_3' + x_3)(x_2' + x_1 x_3)'$. (6)

(ii) Find the minimal–sum–of product expression for the following switching function

$f(x_1, x_2, x_3, x_4, x_5) = \Sigma m\ (1, 2, 3, 6, 8, 9, 14, 17, 24, 25, 26, 27, 30, 31) + \Sigma d\ (4, 5)$. (10)

13. (a) (i) Explain the working of a totempole two input TTL NAND gate and analyse its merits and drawbacks if any. (10)

(ii) Define the terms : fan–out, noise margin, propagation delay. (6)

Or

(b) (i) Explain the working of a two input CMOS NAND gate. (6)

(ii) Write notes on ECL, RTL and HTL logic families. (10)

14. (a) (i) Design and explain the working of a mod–9 counter. (10)

(ii) Write notes on memory decoding techniques. (6)

Or

(b) (i) Explain the working of master–slave JK flip flop. State its merit. (8)

(ii) Explain the Read and Write cycles of RAM. (8)

15. (a) Design a BCD to Excess–3 code converter with (i) PLA (ii) PAL devices.

Or

(b) Design and explain

(i) 4 bit magnitude comparator

(ii) priority encoder.
