2008

2nd Semester Examination

ELECTRONICS

PAPER—EL-1202

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Write the answers Questions of each group in separate books.

Answer *Q. No. 1* and any *three* from the rest.

1. Answer any *five* questions : 5×2

(a) Prove the Boolean function :

$$Y + \overline{X}Z = (X + Y + Z)(\overline{X} + Y + Z)(\overline{X} + Y + \overline{X})$$

(b) Express the function $F(X, Y, Z) = Y(\overline{X} + Z)$ to standard SOP form.

(c) Find out an expression for a logic circuit that has three inputs A, B and C, and whose output will be high only when a majority of the inputs is high.

(d) Define noise margin in Digital ICs.

(e) An 8-bit converter has a full scale output voltage 12V. Find out voltage when the input is 01100110.

(f) What are the performance characteristics of a D/A converter ?

(g) What is the difference between a hatch and a flip-flop ?

(h) Distinguish between Static RAM and Dynamic RAM.

2. (a) Show that SOP and POS forms of a logic expression are equivalent. 2

(b) A three variable function is $F(x, y, z) = \sum m(1,2,4,7)$. Express it in the standard DOS form. 2

(c) Minimize the logic function and realize using NAND gates only.

$f(A,B,C,D) = \sum m(1,3,5,8,9,11,15) + \sum \phi(2,13)$ 3+3

3. (a) What do you mean by an N-to-1 digital multiplexer? Design a 4-to-1 multiplexer using basic gates. 1+3

(b) Implement the function $F(A, B, C) = AB + \overline{BC}$ using

(i) 4-to-1 multiplexer and basic gates.

(ii) 2-to-1 multiplexer and other basic gates if necessary. 3+3

4. (a) What is settling time? 2

(b) Briefly explain the principle operation of a successive approximation ADC with a suitable circuit diagram. 6

(c) An 8-bit successive-approximation converter has a resolution of 15 mV. What will its digital output be for an analog input of 1.87V? 2

5. A 555 timer configured as an astable multivibrator with a pulse duration of 150 μsec and 67% duty cycle, —

(a) What is the ratio of R_1 and R_2?

(b) For C = 0.1 μF, what are the values of R_1 an R_2?

(c) What is pulse repetition frequency? 3+3+4

6. (a) What do you mean by Fan out of a digital IC? 1

(b) Implement a logic function

$F(A,B,C,D) = \overline{AB + \overline{CD}}$ using C-MOS circuits. 3

(c) With proper diagram describe the internal structure of a SRAM cell using MOS circuits. 6