S.E. (Comp) Sem III (R)
Digital Logic Design & Application
25-05-09
3 p.m. to 6 p.m.

Con. 2721–09. (REVISED COURSE) VR–3327

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. (a) Convert $(670{\cdot}17)_8$ into decimal, binary and hex. 6
(b) Design 16 : 1 MUX using 4 : 1 MUX. 6
(c) Design a full subtractor using only NAND gates. 4
(d) Simplify the following using Boolean Laws : 4
(i) $A + \overline{A}\,B + \overline{A}\,\overline{B}\,C + \overline{A}\,\overline{B}\,\overline{C}\,D$
(ii) $A\left[B + C\,\overline{(AB + AC)}\right]$

2. (a) Simplify using K-map, obtain SOP equation and realize using only NAND gates. 10
$f(A, B, C, D) = \pi\, M(1, 2, 3, 8, 9, 10, 11, 14) + d(7, 15)$.
(b) Consider a chemical mixing tank for which there are 3 variables of interest : liquid level, pressure and temperature. The alarm will be triggered under the following conditions : 10
(i) Low level with high pressure
(ii) High level with low pressure
(iii) High level with low temperature and high pressure.
Design the system, implement using only NOR gates.

3. (a) Design BCD to 7–segment code converter. 10
(b) Draw the 2–input TTL NAND gate and explain. List important characteristics of TTL family. 10

4. (a) Design a BCD adder using 4–bit binary adders and explain. 10
(b) Design a MOD–6 synchronous up-counter and explain its operation. 10

5. (a) Simplify using K–map and realize using NOR gates. 10
$f(A, B, C, D) = \Sigma\, m(1, 3, 7, 11, 15) + d(0, 2, 5, 8, 14)$.
(b) Draw a 4–bit Johnson counter using shift register and prove that it is "Divide by 4" logic. 10

6. (a) Simplify using Quine McClusky method. 10
$f(A, B, C, D) = \pi\, m(0, 2, 3, 6, 7, 8, 9, 12, 13)$.
Realize the equation using any universal gate.
(b) Implement the following expression using 8 : 1 MUX. 10
$f(A, B, C, D) = \Sigma\, m(0, 1, 5, 7, 9, 10, 15)$.

7. Write short notes on :– 20

(a) DeMorgan's Theorems

(b) NOR as universal gate

(c) ALU

(d) TTL Vs CMOS logic family.