Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

CPES 5203 (Old)

Special Examination – 2012

DIGITAL ELECTRONIC CIRCUIT

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (i) Find the radix of the number system where '24+17=40'.

   (ii) Perform the following subtraction using 2's compliment.
   $(1101001)_2 - (1011001)_2 = ?$

   (iii) State De Morgan's law ?

   (iv) What is gray code ? Convert $(100110101)_2$ into gray code ?

   (v) What is the difference between combinational circuit and sequential circuit ?

   (vi) What is a Flip-flop ? How many D Flip-flops are required to design MOD-3 counter ?

   (vii) Draw the truth table for the function, F = A + BC.

   (viii) State the difference between "latch" and "flip-flop".

   (ix) How many 16K ×1 RAMs are required to obtain a memory with word capacity of 64K ? The world length is of eight bits.

   (x) How many clock pulses are required shift eight bits of data into and out of an eight bit serial-in serial-out shift register ?

2. (a) Establish the following identities of Boolean algebra 5

   (i) A + AB = A

   (ii) (A + B)(A + C) = A + BC

   (b) A circuit has three inputs and one output terminal. The output is 1 if any two of the three inputs are 1 and zero for the rest condition. Design the combinational circuit with necessary logic gates. 2.5

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(c) An equality detector gives the output Y=1, if both the inputs of the combinational circuits are same and zero for other remaining conditions. Implement the circuit using logic gates. 2.5

3. (a) Simplify F (A, B, C, D) = ABC + BCD + AD using K_Map. 4

(b) What is a Full adder circuit ? Draw its truth table. Design a Full adder circuits using two half adder circuits and 'OR' gates. 6

4. The four variable logic function can be expressed as

F (A, B, C, D) = $\sum$ (1, 2, 5, 7, 9, 11, 14). Realize the above function using

(a) 8 ×1 MUX

(b) NAND gates only

(c) NOR gates only. 10

5: (a) Design a MOD -7 synchronous counter with T flip-flops. 5

(b) What is a shift register ? Explain the principle of a 4-bit parallel-in parallel-out shift register. 5

6. (a) What is Hamming code ? Explain, how error is detected and corrected at the receiving end using hamming code ? 5

(b) Obtain EX_OR logic operation using only NAND logic gates. Explain the importance of EX-OR logic gates in transmission of binary digits. 5

7. (a) What is "Fan in" and "Fan out" of the integrated logic circuits ? 2

(b) Explain the use of preset and clear inputs in a flip-flop. 2

(c) What is propagation time of a counter ? Find the propagation time of a synchronous MOD-39 counter if the propagation time of the NAND gate and T-flip-flop used in the counter is 12 and 21 nano second respectively. 3

(d) State the difference between Static RAM and Dynamic RAM. 3

8. Write short notes on any **two** : 5×2

(a) ECL

(b) Encoder

(c) Magnitude comparator

(d) C-MOS logic