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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech(Integrated)

SEM: III - THEORY EXAMINATION - (2024- 2025)

Subject: Digital Logic & Circuit Design

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- 1-a. A ____ expression consists of several product terms logically added. (CO1,K1) 1
- (a) Sum of products
 - (b) Canonical POS form
 - (c) Minterm
 - (d) Switch
- 1-b. The Gray code for binary number 110010 is _____. (CO1,K2) 1
- (a) 10101
 - (b) 11011
 - (c) 1000
 - (d) 101011
- 1-c. One that is not the outcome of magnitude comparator is----- (CO2,K1) 1
- (a) $a > b$
 - (b) $a - b$
 - (c) $a < b$
 - (d) $a = b$
- 1-d. Multiplexers, demultiplexers, decoders, encoders are _____ logic 1
- circuits. (CO2,K1)
- (a) Sequential circuit
 - (b) Combinational circuit

- (c) Synchronous sequential circuit
- (d) Asynchronous sequential circuit
- 1-e. A 5-bit asynchronous binary counter is made up of five flip-flops, each with a 12 ns propagation delay. The total propagation delay is _____. (CO3,K1) 1
- (a) 12 ms
- (b) 24 ns
- (c) 48 ns
- (d) 60 ns
- 1-f. The D flip flop obtained from SR flip flop by just putting _____. (CO3,K1) 1
- (a) one inverter between S & R terminal
- (b) connecting S & R terminal together
- (c) feedback the output in feed to the S & R terminal using XOR gate
- (d) None of These
- 1-g. The delay elements provide ----- (CO4,K1) 1
- (a) large memory
- (b) outputs
- (c) clock pulses
- (d) short term memory
- 1-h. The logic circuits whose outputs at any instant of time depends on both, present input and past outputs are called.....(CO4,K1) 1
- (a) Combinational circuits
- (b) Sequential circuits
- (c) Latches
- (d) Flip-flops
- 1-i. The full form of EPROM is _____ (CO5,K1) 1
- (a) Easy Programmable Read Only Memory
- (b) Erasable Programmable Read Only Memory
- (c) Eradicate Programmable Read Only Memory
- (d) Easy Programmable Read Out Memory OR gate
- 1-j. PLDs with programmable AND and fixed OR arrays is called as _____. (CO5,K1) 1
- (a) PAL
- (b) PLA
- (c) APL
- (d) PPL

2. Attempt all parts:-

- 2.a. Define Canonical form representation of Boolean Function. (CO1,K2) 2
- 2.b. Draw the circuit diagram of 1 bit binary comparator. (CO2,K2) 2

- 2.c. Write the excitation tables for JK and T flip flops. (CO3,K2) 2
- 2.d. Define primitive flow table with an example. (CO4,K2) 2
- 2.e. What is the major difference between DRAM and SRAM? (CO5,K1) 2

SECTION-B

30

3. Answer any five of the following:-

- 3-a. Explain prime implicants, essential prime implicants and selective prime implicants. (CO1,K2) 6
- 3-b. Find the minimized form of $Y = A'B'C' + A'B'C + AB'C + AD$ using K-map. (CO1,K3) 6
- 3-c. Explain BCD Adder with proper logic circuit diagram. (CO2,K2) 6
- 3-d. Implement the following Boolean function with 8:1 multiplexer (CO3,K3) 6
 $F(A,B,C,D) = \sum m(0,2,4,7, 11, 12,15)$
- 3.e. Explain the different types of shift register in details. (CO3,K2) 6
- 3.f. Explain the following related to asynchronous circuits. (CO4,K2) 6
 a. Hazards b. Oscillations c. Critical Races
- 3.g. Give the comparison between PROM, EPROM and EEPROM. (CO5,K2) 6

SECTION-C

50

4. Answer any one of the following:-

- 4-a. Minimize the given four variable logic function using K-Map OR Quine McClusky Method:- (CO1,K3) 10
 $F(A, B, C, D) = \sum m(0,1, 2, 3,5, 7, 8, 9, 11, 14)$
- 4-b. What is Hamming Code? Construct the hamming code for data 10110110. Use even parity (CO1,K3) 10

5. Answer any one of the following:-

- 5-a. Design 4 bit Gray to binary code converter. (CO2,K3) 10
- 5-b. Implement a full adder using a decoder. (CO2,K3) 10

6. Answer any one of the following:-

- 6-a. Explain Johnson Counter and compare it with simple Ring Counter. (CO3,K3) 10
- 6-b. What is a flip-flop? Convert D F/F into T F/F. (CO3,K3) 10

7. Answer any one of the following:-

- 7-a. Enlist the categories of state machines and Draw the state and flow table of asynchronous counter. (CO4,K2) 10
- 7-b. Explain state table and state diagram with the help of an example. (CO4,K2) 10

8. Answer any one of the following:-

- 8-a. Draw the block diagram of PLA. Also implement the function with PLA OR PROM. (CO5,K3) 10
 $F1 = \sum m(0,1,4,5)$ and $F2 = \sum m(1,2,5,6)$
- 8-b. Compare PROM, PLA & PAL in details. (CO5,K2) 10