Register Number:……..

KUMARAGURU
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## GENERAL INSTRUCTIONS TO THE CANDIDATES

1. Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level ($K_1$ to $K_6$)
2. Candidates are strictly instructed not to write anything in the question paper other than their roll number.
3. Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.
4. Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.
5. Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

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**B.TECH DEGREE EXAMINATIONS: DEC 2015**

(Regulation 2014)

Third Semester etc.

**INFORMATION TECHNOLOGY**

U14ITT302: Digital Systems And Design

**Time: Three Hours** **Maximum Marks: 100**

**Answer all the Questions:-**
**PART A (10 x 1 = 10 Marks)**

1. CO1 [$K_2$]

| List I | List II |
|---|---|
| A. $(823)_{10}$ to octal | 1. 1100000110.1101 |
| B. $(306.D)_{10}$ to binary | 2. 10110 |
| C. 10101101 to gray | 3. 1467 |
| D. 11101 to binary | 4. 11111011 |

| | A | B | C | D |
|---|---|---|---|---|
| a) | 3 | 1 | 4 | 2 |
| b) | 3 | 2 | 4 | 1 |
| c) | 1 | 2 | 4 | 3 |
| d) | 4 | 2 | 1 | 3 |

2. CO3 [$K_2$]

| List I | List II |
|---|---|
| A. JK flip flop | 1. used as asynchronous building block |
| B. level triggering | 2. Triggered when the clock is going 0 to 1 |
| C. SR Latch | 3. complement the state when both inputs are '1' |
| D. Positive edge triggering | 4. output varies whenever input changes |

| | A | B | C | D |
|---|---|---|---|---|
| a) | 1 | 2 | 4 | 3 |
| b) | 4 | 2 | 1 | 3 |
| c) | 3 | 4 | 1 | 2 |
| d) | 3 | 1 | 4 | 2 |

3. The binary representation for the following octal number is $(372.324)_8$ is CO1 [$K_2$]

a) $(011001110011.0010010010)_2$ b) $(011111010.011010100)_2$

c) $(11001110011.0010110100)_2$ d) $(110111011.001010100)_2$

4. What is the characteristic equation for JK flip flop? CO3 [$K_2$]

a) JQ' + K'Q b) T 'Q' + T Q

c) J'T+ TQ d) JQ'+KQ

5. Consider the following statements. CO1 [$K_2$]

1. Excess-3 code is also called as self complementary code.
2. Any Boolean function can't be expressed as product of sums.
3. Ignore the resulting carry when subtract using r's complements.
4. The output of ex-or gate is 1 when both the inputs are same

Which of these statements are correct?

a) 1,2 b) 2,3

c) 1,3 d) 3,4

6. Consider the following statements. CO3 [$K_4$]

1. Any function can also be realized using either decoder or multiplexer.
2. BCD to Excess -3 code converter can be designed using4 bit full adder IC 7483.
3. An encoder has one input, 2 selection lines and 4 output lines.
4. BCD adder can be designed using only one 4 bit binary adder.

Which of these statements are correct?

a) 2,4 b) 1,4

c) 1,2 d) 3,4

7. The following items consist of two statements, one labeled as the "Assertion (A)" and the other as "Reason (R). You are to examine those two statements carefully and select the answers to these items using the codes given below: CO2 [$K_2$]

Assertion: NAND and NOR gates are universal gates.

Reason: All logic gates can be derived using NAND and NOR gates.

a) both A and R are individually true and R is the correct explanation of A

b) both A and R are individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

8. Assertion: Programmable logic array is very flexible device CO5 [$K_2$]

Reason: It has AND & OR array both of which are programmable

a) both A and R are individually true and R is the correct explanation of A

b) both A and R are individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

9. Consider the following statements. CO3 [$K_4$]

1. Mark the input and output values for each transition line under which transition occurs.
2. Draw the circle to represent each state.
3. Find out number of states from the given problem.
4. By referring state table draw the transition line to denote the next state.

The correct sequence drawing the state table is

a) 2-3-1-4

b) 4-1-2-3

c) 3-2-4-1

d) 4-2-1-3

10. Consider the following statements. CO4 [$K_3$]

1. Obtain Present state – Next state table of desired flip flop X.
2. Using excitation table of chosen flip flop of Y obtain next state.
3. Draw the logic for the desired flip flop using next state generator logic and the chosen flip flop Y.
4. Using K-map simplify the logic expression for excitation inputs of flip flop Y.

The correct sequence of the realization of one flip flop using other flip flop is

a) 2-4-1-3

b) 4-2-3-1

c) 1-2-4-3

d) 1-3-4-2

**PART B (10 x 2 = 20 Marks)**
**(Answer not more than 40 words)**

11. Add $3\ B_{16} + A\ 5_{16}$. CO1 [$K_3$]

12. Using De Morgan's theorems convert an expression $Z = \overline{(A + B) \cdot \bar{C}}$ to one that has only single variable inversions. CO2 [$K_3$]

13. How is the NOT gate function obtained from 2 input EX OR and EX NOR gates? CO2 [$K_3$]

14. What will be the maximum number of outputs for a decoder with a 6 bit data word? CO3 [$K_3$]

15. Give the meaning for edge triggering in Flip Flops. CO3 [$K_2$]

16. Draw the logic diagram of a three state count up ripple counter. CO3 [$K_2$]

17. When are two states considered equivalent in sequential circuits? Explain with example. CO3 [$K_4$]

18. Differentiate between static and dynamic hazard. CO4 [$K_2$]

19. Give the logic table of an EPROM, which will multiply two 2-bit binary numbers. CO5 [$K_3$]

20. Write in short about CMOS. CO5 [$K_2$]

**Answer any FIVE Questions:-**
**PART C (5 x 14 = 70 Marks)**
**(Answer not more than 300 words)**

**Q.No. 21 is Compulsory**

21. i) A seven bit Hamming code is received as 1010011. What was the code transmitted? (4) CO1 [$K_4$]

ii) Reduce the following equation using the tabular method of minimization. (10) CO2 [$K_3$]

$F = m_0 + m_2 + m_3 + m_5 + m_8 + m_{10} + m_{11} + m_{13}$

22. Reduce the given function in SOP and POS forms after identifying the essential and non essential prime implicants: $F = \bar{A}\,\bar{B}\,\bar{C}\,\bar{D} + \bar{A}\,\bar{B}\,\bar{C}\,D + \bar{A}\,\bar{B}\,C\,D + \bar{A}\,B\,\bar{C}\,\bar{D} + \bar{A}\,B\,\bar{C}\,D + \bar{A}\,B\,C\,D$ CO2 [$K_3$]

23. i) Construct a full adder using basic gates. (7) CO3 [$K_2$]

ii) Implement the following function using multiplexer. (7) CO3 [$K_3$]

$F = \mathbf{A\,\bar{C}\,D + C\,\bar{D} + \bar{A}\,\bar{B}\,\bar{D} + A\,B\,\bar{D}}$

24. i)Draw the schematic of a 4 bit left shift register with parallel loading using D FFs and the timing diagram. (7) CO3 [$K_2$]

ii) Draw a JK FF and derive its Characteristic Equation. (7) CO3 [$K_2$]

25. Reduce the number of states in the following state table and tabulate the reduced state table. Give state assignment also. CO4 [$K_3$]

| Present state | next state | | output | |
|---|---|---|---|---|
| | x = 0 | x= 1 | x=0 | x=1 |
| a | f | b | 0 | 0 |
| b | d | c | 0 | 0 |
| c | f | e | 0 | 0 |
| d | g | a | 1 | 0 |
| e | d | c | 0 | 0 |
| f | f | b | 1 | 1 |
| g | g | h | 0 | 1 |
| h | g | a | 1 | 0 |

26. i) Realise the following function using PAL :A= xy'z+x'yz'+xy. 8 CO5 [$K_3$]

ii) Compare the features of TTL and ECL families. 6 CO5 [$K_2$]

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