Ref. No. REFNO039051

B.Sc. (Hons.) Semester - II Examination 2020-21
Computer Science
Paper code: CS102- Digital Logics and Circuits

Time : Four Hours **Full Marks: 70**

Instructions

1. The Question Paper contains 08 questions out of which you are required to answer any 04 questions. The question paper is of 70 marks with each question carrying 17.5 marks. प्रश्नपत्र में आठ प्रश्न पूछे गये हैं जिनमें से 4 प्रश्नों का उत्तर देना है। प्रश्नपत्र 70 अंकों का है, जिसमें प्रत्येक प्रश्न 17.5 अंक का है।
2. The total duration of the examination will be 4 hours (Four hours), which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-writing answer sheets on the portal. परीक्षा का कुल समय 4 घंटे का है जिसमे प्रश्न पत्र को पोर्टल से डाउनलोड करके पुनः हस्तलिखित प्रश्नों का उत्तर पोर्टल पर अपलोड करना है।
3. For the students with benchmark disability as per Persons with Disability Act, the total duration of examination shall be 6 hours (six hours) to complete the examination process, which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal. दिव्यांग छात्रों के लिये परीक्षा का समय 6 घंटे निर्धारित हैं जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करना एवं हस्तलिखित उत्तर को पोर्टल पर अपलोड करना है।
4. Answers should be hand-written on a plain white A4 size paper using black or blue pen. Each question can be answered in upto 350 words on 3 (Three) plain A4 size paper (only one side is to be used). हस्तलिखित प्रश्नों का उत्तर सादे सफेद 14 साइज के पन्ने पर काले अथवा नीले कलम से लिखा होना चाहिये। प्रत्येक प्रश्न का उत्तर 350 शब्दों तक तीन सादे पृष्ठ 14 साइज में होना चाहिए। प्रश्नों के उत्तर के लिए केवल एक तरफ के पृष्ठ का ही उपयोग किया जाना चाहिए।
5. Answers to each question should start from a fresh page. All pages are required to be numbered. You should write your Course Name, Semester, Examination Roll Number, Paper Code, Paper Title, Date and Time of Examination on the First sheet used for answers. प्रत्येक प्रश्न का उत्तर नये पृष्ठ से शुरू करना है। सभी पृष्ठों को पृष्ठांकित करना है। छात्र को प्रथम पृष्ठ पर प्रश्नपत्र का विषय, सेमेस्टर, परीक्षा अनुक्रमांक, प्रश्नपत्र कोड, प्रश्नपत्र का शीर्षक, दिनांक एवं समय लिखना है।

	Questions	**Marks**
1	(a) A line printer is capable of printing 132 characters in a single-line and each character is represented by ASCII code. How many bits are required to print each line?	[4]
	(b) Compute, $(21)_3 + (2E)_{16} + (101.01)_2 + (121)_4 = (?)_2$	[4]
	(c) Encode the decimal number 35 to Gray code. Write down the applications of Gray code.	[3.5]
	(d) Obtain Excess-3 code and 10's complement for $(228)_{10}$.	[3]
	(e) Perform the subtraction $(13)_{10} - (5)_{10}$ using 9's complement method.	[3]

P.T.O.

2 (a) Simplify the following expression once by considering the don't care conditions and once by ignoring don't care condition. [8]

$$F(A, B, C, D) = \sum m(1, 4, 8, 12, 13, 15) + \sum d(3, 14)$$

(b) Implement the following function with either NAND or NOR gates. Use only four gates. Only the normal inputs are available. [5]

F=w'xz+w'yz+x'yz'+wxy'z

d=wyz

(c) What are reflected binary codes? Why is it needed in K-MAP? [4.5]

3 (a) Design a 2-bit magnitude comparator. [5]

(b) Implement 1:32 demultiplexer using 1:8 demultiplexer. What is the difference between decoder and demultiplexer. [5]

(c) Implement the following Boolean function using 8:1 Multiplexer. [7.5]

$F(A, B, C, D) = A'B'D'+ABC+B'CD+A'CD$

4 (a) Describe with neat diagram, AND-OR structure of PLA and PAL. [5]

(b) Design a BCD to Excess-3 code converter and implement it using a suitable PLA. [6]

(c) A combinational circuit is defined by the following three functions: [6.5]

F_1=x'y'+xyz'

F_2=x'+y

F_3=xy+x'y'

Design the circuit with a decoder and external gates.

5 (a) What is sequential circuit? Write down the differences between synchronous and Asynchronous circuits. [4]

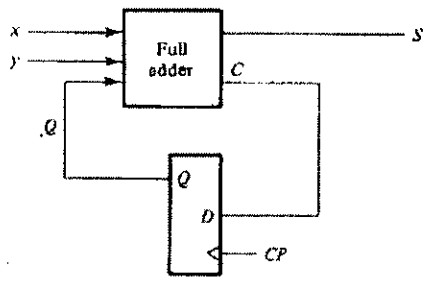
(b) What is state reduction? Why is it needed? Reduce the number of states in the following state table and tabulate the reduced state table [8]

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

Starting from state 'a' of the state table, find the output sequence generated with an input sequence 01110010011.

(c) Draw a neat diagram of clocked JK flipflop using NAND gates. What is race around condition? How does it get eliminated in Master Slave JK flipflop? [5.5]

6 (a) The full adder receives two external inputs x and y; the third input z comes from the output of a D flipflop. The carry output is transferred to the flopflop every clock pulse. The external S output gives the sum of x, y, and z. Derive the state table and state diagram of the sequential circuit **[10.5]**



(b) Can a flipflop be used as a memory? If so how many bits can be stored by J-K flipflop? **[2]**

(c) How many flipflop must be complemented in a 10 bit binary ripple up counter to reach the next count after 0111111111? **[5]**

7 (a) The content of a 4-bit shift register is initially 1101. The register is shifted six times to the right, with the serial input being 101101. What is the content of the register after each shift? **[6.5]**

(b) What is the difference between serial and parallel transfer? What type of register is used in each case? **[5]**

(c) What is RAM? Draw the internal structure of a 4 × 4 RAM. Show the read/write operation on it. **[6]**

8 (a) Draw the logic diagram of 3-bit binary ripple up counter using flipflop that trigger on the positive edge. Explain it with the help of timing diagram. [6]

(b) Construct a Johnson counter with ten timing signals. Write its applications. [5]

(c) Design a synchronous BCD counter with JK flipflops. Explain its working in detail. [6.5]

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