



SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)

(Established under Section 3 of the UGC Act, 1956)
Re-accredited by NAAC with 'A' Grade (3.58/4) Awarded Category - I by UGC

Seat No.						
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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY

Specialization : Computer Science and Engineering,Information Technology

Batch: 2012-16,2014-18

Semester: III

Course: Digital Electronics & Logic Circuits

Course Code: 0701210305CS,0701210305IT

Date: 28/11/2019

ESE-2019-october

CS / IT

Sem - III

Day: Thursday

Maximum Marks: 60

Time: 01:30 pm - 04:00 pm

Instructions:

1. All questions are compulsory.
2. Draw neat diagrams wherever necessary.
3. Use of non-programmable calculators is allowed.
4. Make suitable assumptions wherever required.

Q.1 a) Simplify the Boolean function using K-map and realize it using NAND gates: 8 CO1

$$Y = \pi M(4, 5, 6, 7, 8, 10, 12, 13, 14, 15)$$

b) Design basic gates like NOT, AND, OR using universal gates NAND and NOR. 6 CO1

Q.2 Define Power dissipation, fan-out and propagation delay. 6 CO2

Q.3 a) Perform the followings: 5 CO3

i) $(AE7)_{16} - (875)_{16} = ()_{16}$ Hexadecimal subtraction using 16's complement.

ii) $(789)_{10} - (432)_{10} = ()_{10}$ BCD subtraction using 10's complement.

b) Design and explain with Truth Table 16:1 multiplexer using 4:1 multiplexers. 6 CO4

c) Design full subtractor using half subtractor along with truth table and K-map. 5 CO4

Q.4 a) Explain SR flip flop with preset and clear input. Also draw the truth table. 7 CO5
What are the drawbacks of SR flip flop?

b) Draw and explain the circuit diagram of 5-bit Serial In/Serial out (SISO) 7 CO5
shift register. Show the timing diagram for specified data input 10101.
Assume register initially clear all (0s).

~~redotoo - P1081323~~
Q.5 Draw and explain ASM chart for mod 4 up counter with the condition that 5 CO6
there exist an input signal W and if $W=1$, the count is incremented by 1
otherwise it remains same.

Q.6 Explain the internal architecture of a PLA. 5 CO7



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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070124) BACHELOR OF TECHNOLOGY (INFORMATION TECHNOLOGY)

Batch: 2018-22

Semester: III

Course: Fundamentals of Data Structures

Course Code: 0701240304

Date: 02/12/2019

Maximum Marks: 60

Day: Monday

Time: 09:45 am - 12:15 pm

Instructions:

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Make suitable assumptions wherever required.

Q.1 a) Define ADT. State and explain different types of data structure. 7 CO1

b) What is call by value and call by reference in a function? Write a program to swap two numbers using call by value and call by reference. 8 CO1

Q.2 a) Write function code for merge sort. State its time complexity. Sort following example using merge sort: 10 CO2

1, 5, 7, 8, 2, 4, 6, 9

b) Apply bubble sort techniques for following set of input, show all the passes: 4 CO2

8, 7, 2, 5, 10, 1, 6, 3

Q.3 a) Write a C-function code to check well formedness of parenthesis. 8 CO3
Convert following infix expression into prefix expression:

((a b - (c + d / e ^ f) - g) h)

b) What is stack data structure? State its applications. 3 CO3

Q.4 a) Write 'C' functions for following operations on a double ended **10 CO4** queue using arrays:

- i) Enqueue using front
- ii) Enqueue using rear
- iii) Dequeue using front
- iv) Dequeue using rear

b) Explain different types of queue.

4 CO4

Q.5 What is the difference between text and binary file? State and **6 CO5** explain the different modes of opening a file in C using fopen() function.

OR

Q.5 What is hashing? Explain different hashing techniques.

6 CO5



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Batch: 2018-22

Semester: III

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Course Code: 0701240304

Date: 02/12/2019

Maximum Marks: 60

Day: Monday

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Instructions:

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2. Neat diagrams must be drawn wherever necessary.
3. Make suitable assumptions wherever required.

Q.1 a) Define ADT. State and explain different types of data structure. 7 CO1

b) What is call by value and call by reference in a function? Write a 8 CO1 program to swap two numbers using call by value and call by reference.

Q.2 a) Write function code for merge sort. State its time complexity. Sort 10 CO2 following example using merge sort:

1, 5, 7, 8, 2, 4, 6, 9

b) Apply bubble sort techniques for following set of input, show all the 4 CO2 passes:

8, 7, 2, 5, 10, 1, 6, 3

Q.3 a) Write a C-function code to check well formedness of parenthesis. 8 CO3 Convert following infix expression into prefix expression:

((a b - (c + d / e ^ f) - g) h)

b) What is stack data structure? State its applications. 3 CO3

Q.4 a) Write 'C' functions for following operations on a double ended **10 CO4** queue using arrays:

- i) Enqueue using front
- ii) Enqueue using rear
- iii) Dequeue using front
- iv) Dequeue using rear

b) Explain different types of queue.

4 CO4

Q.5 What is the difference between text and binary file? State and **6 CO5** explain the different modes of opening a file in C using fopen() function.

OR

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Programme: (070124) BACHELOR OF TECHNOLOGY (INFORMATION TECHNOLOGY)

Batch: 2018-22

Semester: III

Course: Computer Organization

Course Code: 0701240306

Date: 03/12/2019

Maximum Marks: 45

Day: Tuesday

Time: 09:45 am - 11:15 am

Instructions:

1. All questions are compulsory.
2. Make suitable assumptions wherever required.
3. Neat diagram must be drawn whenever necessary.

- Q.1** a) Demonstrate $178.1875_{(10)}$ in single precision floating point and 6 CO1 double precision format.
- b) Demonstrate $169/12$ using Restoring algorithm for division. 6 CO1
- Q.2** a) Illustrate register organization of 8086 microprocessor. 6 O2
- b) Summarize different types of flag registers in 8086 4 CO2 microprocessor.
- Q.3** Illustrate structure of hardwired control unit operations. 6 CO3
- Q.4** a) Main memory has 3 page frames and processor requires pages 6 CO4 from virtual memory in following Order:
 7 2 4 6 4 5 5 3 4 2 3 4
Show implementation of First-In First-Out, Least Recently Used and Optimal algorithms. Compare page faults.
- b) Explain how mapping is performed in associative mapping cache 6 CO4 organization with suitable diagram.
- Q.5** Demonstrate working mechanism of optical mouse. 5 CO5



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Programme: (070122) BACHELOR OF TECHNOLOGY (COMPUTER SCIENCE AND ENGINEERING)
(070124) BACHELOR OF TECHNOLOGY (INFORMATION TECHNOLOGY)

Batch: 2017-21,2018-22

Semester: III

Course: Digital Electronics and Logic Design

Course Code: 0701220307,0701240307

Date: 28/11/2019

Maximum Marks: 45

Day: Thursday

Time: 01:30 pm - 03:00 pm

Instructions:

1. All questions are compulsory.
2. Draw neat diagrams wherever necessary.
3. Use of non-programmable calculators is allowed.
4. Make suitable assumptions wherever required.

Q.1 Perform the following: 8 CO1

- $(111110.1)_2 \div (0101)_2 = ()_2$ Binary division.
- $(687)_{16} - (DEB)_{16} = ()_{16}$ Hexadecimal subtraction using 16's complement.
- $(222)_{10} - (542)_{10} = ()_{10}$ BCD subtraction using 10's complement.
- $(165)_8 - (543)_8 = ()_8$ Octal subtraction using 8's complement.

Q.2 Solve the following equation using algebraic simplification. Realize the answer using NAND gates only: 4 CO2

$$Y = (A + B + \bar{C})(A + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})(\bar{A} + \bar{B} + \bar{C})$$

Q.3 a) Solve the equation using k-map: 3 CO3

$$Y = \sum M(0, 2, 4, 6, 7, 8, 10, 11, 14). d(5, 9, 13)$$

b) Convert the following expression into standard SOP form. 3 CO3

$$Y = A'B + AC' + BC + B'C$$

- Q.4** a) Design 1:16 demultiplexer using 1: 4 demultiplexer circuits using truth table. **5 CO4**
- b) Design 4 bit BCD adder using truth table and K-map. **6 CO4**
- Q.5** a) Draw and explain the circuit diagram of 4-bit Serial In/Parallel out (SIPO) shift register. **6 CO5**
- b) Explain JK flip flop with preset and clear input. Also draw the truth table. What is the major drawback of JK flip flop? **6 CO5**
- c) Compare sequential and combinational circuits. **4 CO5**



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Programme: (070121) BACHELOR OF TECHNOLOGY

Specialization : Computer Science and Engineering,Information Technology

Batch: 2014-18,2015-19,2016-20

Semester: III

Course: Digital Electronics & Logic Design

Course Code: 0701220305CS,0701240305IT

Date: 28/11/2019

Maximum Marks: 60

Day: Thursday

Time: 01:30 pm - 04:00 pm

Instructions:

1. All questions are compulsory.
2. Draw neat diagrams wherever necessary.
3. Use of non-programmable calculators is allowed.
4. Make suitable assumptions wherever required.

- Q.1** a) Simplify the Boolean function using K-map and realize it using NAND gates: 8 CO1
$$Y = \pi M(4, 5, 6, 7, 8, 10, 12, 13, 14, 15)$$
- b) Design basic gates like NOT, AND, OR using universal gates NAND and NOR. 6 CO1
- Q.2** Define Power dissipation, fan-out and propagation delay. 6 CO2
- Q.3** a) Perform the followings: 5 CO3
i) $(AE7)_{16} - (875)_{16} = (\)_{16}$ Hexadecimal subtraction using 16's complement.
ii) $(789)_{10} - (432)_{10} = (\)_{10}$ BCD subtraction using 10's complement.
- b) Design and explain with Truth Table 16:1 multiplexer using 4:1 multiplexers. 6 CO4
- c) Design full subtractor using half subtractor along with truth table and K-map. 5 CO4

- Q.4** a) Explain SR flip flop with preset and clear input. Also draw the truth table. 7 CO5
What are the drawbacks of SR flip flop?
- b) Draw and explain the circuit diagram of 5-bit Serial In/Serial out (SISO) 7 CO5
shift register. Show the timing diagram for specified data input 10101.
Assume register initially clear all (0s).
- Q.5** Draw and explain ASM chart for mod 4 up counter with the condition that 5 CO6
there exist an input signal W and if $W=1$, the count is incremented by 1
otherwise it remains same.
- Q.6** Explain the internal architecture of a PLA. 5 CO7



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Programme: (070122) BACHELOR OF TECHNOLOGY (COMPUTER SCIENCE AND ENGINEERING)
(070124) BACHELOR OF TECHNOLOGY (INFORMATION TECHNOLOGY)

Batch: 2017-21,2018-22

Semester: III

Course: Computer Organization

Course Code: 0701220306,0701240306

Date: 26/11/2019

Maximum Marks: 45

Day: Tuesday

Time: 01:30 pm - 03:00 pm

Instructions:

1. All questions are compulsory.
2. Make suitable assumptions wherever required.
3. Neat diagram must be drawn whenever necessary.

- Q.1** a) Demonstrate $(-14)*(-5)$ using Booth's algorithm using 5 bit **6 CO1** numbers.
b) Demonstrate $1460.125_{(10)}$ in single precision floating point and **6 CO1** double precision format.
- Q.2** a) Outline different types of instruction formats with example. **4 CO2**
b) Illustrate bus interface unit of 8086 microprocessor. **6 CO2**
- Q.3** Explain micro-programmed control unit proposed by Wilkes. **6 CO3**
- Q.4** a) Main memory has 3 page frames and processor requires pages **6 CO4** from virtual memory in following order:
1 2 3 3 4 2 3 1 4 2 5 4
Show implementation of First-In First-Out, Least Recently Used and Optimal algorithms. Compare page faults.
b) Explain how mapping is performed in direct mapping cache **6 CO4** organization with suitable diagram.
- Q.5** Demonstrate working mechanism of inkjet printer. **5 CO5**



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Programme: (070121) BACHELOR OF TECHNOLOGY

Specialization : Computer Science and Engineering,Information Technology

Batch: 2012-16,2014-18,2015-19,2016-20

Semester: III

Course: Computer Organization

Course Code: 0701220304CS,0701240304IT

Date: 26/11/2019

Maximum Marks: 60

Day: Tuesday

Time: 01:30 pm - 04:00 pm

Instructions:

1. All questions are compulsory.
2. Make suitable assumptions wherever required.
3. Neat diagram must be drawn whenever necessary.

- Q.1** a) Draw a flowchart of restoring binary division. Perform 17 / 3. 6 CO1
 b) Demonstrate 99.625₍₁₀₎ in single precision floating point format. 4 CO1
 c) Explain different interconnection structures with neat diagram. 6 CO1
- Q.2** a) Illustrate register organization of 8086 microprocessor. 6 CO2
 b) Summarize instruction pipelining. 4 CO2
- Q.3** a) Outline structure of micro-programmed control unit. 6 CO3
 b) Explain microinstruction format with neat diagram. 4 CO3
- Q.4** a) Main memory has 3 page frames and processor requires pages from virtual memory in following order:
 4 5 6 3 4 8 3 5 4 6 5 4
Show implementation of First-In First-Out, Least Recently Used and Optimal algorithms. Compare page faults.
 b) Outline memory hierarchyand explain. 4 CO4
- Q.5** Explain how mapping is performed in associative mapping cache organization with suitable diagram. 4 CO5
- Q.6** a) Explain block diagram of I/O module. 6 CO6
 b) Demonstrate working mechanism of computer's input device: Mouse. 4 CO6



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Programme: (070121) BACHELOR OF TECHNOLOGY

Specialization : Computer Science and Engineering, Information Technology

Batch: 2016-20

Semester: III

Course: Fundamentals of Data Structures

Course Code: 0701220303CS,0701240303IT

Date: 23/11/2019

Maximum Marks: 45

Day: Saturday

Time: 01:30 pm - 03:00 pm

Instructions:

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Make suitable assumptions wherever required.

Q.1 a) What is ADT? Explain different types of data structures. 5 CO1
b) Write a C-program to subtract two 2D-matrices. 5 CO1

Q.2 a) Write C-function for selection sort. Show passes of selection sort for 8 CO2
following set of input:

86, 6, 25, -2, 65, 95, 3, 9, 115, 15.

b) Explain binary search algorithm with example. 2 CO2

Q.3 a) Write an algorithm to convert a Prefix expression to Infix expression. 8 CO3
Convert following Prefix expression to Infix expression:

+ / + A B - P T E

b) Discuss different operations performed on stack data structure. 2 CO3

Q.4 a) Write 'C' program to implement following operations on a Circular 8 CO4
Queue using appropriate data structure:

- i) Insert an element
- ii) Delete an element
- iii) Display queue contents
- iv) Queue full
- v) Queue empty

b) What are applications of queue data structure?

2 CO4

Q.5 Answer the following

5 CO5

- i) What are different file opening modes and their usage?
- ii) What is the difference between Text and Binary File?
- iii) Which function is used to read and write a block of data?
- iv) Write the command to move 20 bytes back from the end of the file.
- v) Write the command to move 20 bytes back from the current position.



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Programme: (070122) BACHELOR OF TECHNOLOGY (COMPUTER SCIENCE AND ENGINEERING)
(070124) BACHELOR OF TECHNOLOGY (INFORMATION TECHNOLOGY)

Batch: 2012-16,2014-18,2015-19,2017-21,2018-22

Semester: III

Course: Fundamentals of Data Structures

Course Code: 0701220304,0701240304,0701210303CS,0701210303IT

Date: 23/11/2019

Maximum Marks: 60

Day: Saturday

Time: 01:30 pm - 04:00 pm

Instructions:

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Make suitable assumptions wherever required.

Q.1 a) Write function code for following string operations using with and without library function. 8 CO1

i) String length ii) String Copy

b) Explain recursion. Write C-program for factorial of a number using recursion. 7 CO1

Q.2 a) Write function code for binary search and discuss its time complexity. 10 CO2

b) Apply insertion sort techniques for following set of input, show all passes. 4 CO2

86, 6, 25, -2, 65, 95, -3, 9, 115, 15

Q.3 a) Write an algorithm to convert an Infix expression to Postfix expression. Convert following infix expression into postfix using stacks. 7 CO3

$(A + B * C - D) / (E * F)$

b) Explain different operations on stack. 4 CO3

Q.4 a) Write 'C' program to implement following operations on a linear **10 CO4** queue using arrays.

- i) Insert an element
- ii) Delete an element
- iii) Display queue contents
- iv) Queue full
- v) Queue empty

b) Explain different types of queue **4 CO4**

Q.5 What is the difference between text and binary file? State and Explain **6 CO5** the different modes of opening a file in C using fopen() function.

OR

Q.5 What is hashing? Explain different hashing techniques. **6 CO5**



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Programme: (070122) BACHELOR OF TECHNOLOGY (COMPUTER SCIENCE AND ENGINEERING)
(070124) BACHELOR OF TECHNOLOGY (INFORMATION TECHNOLOGY)

Batch: 2012-16,2014-18,2015-19,2016-20,2017-21,2018-22

Semester: III

Course: Programming Paradigms

Course Code: 0701220302,0701240302,0701220302CS,0701240302IT

Date: 21/11/2019

Maximum Marks: 45

Day: Thursday

Time: 01:30 pm - 03:00 pm

- Instructions:**
- 1) All questions are compulsory.
 - 2) Draw neat diagrams if required.
 - 3) Assume suitable data if required.

Q.1	a)	Discuss any four characteristics of good programming languages.	3	CO1
	b)	Elaborate principles of language design.	3	CO1
Q.2	a)	Explain the properties of data types and data objects.	3	CO2
	b)	Compare POP and OOP with proper code.	3	CO2
Q.3	a)	Write different types of constructors and construct a program using constructors and destructor.	5	CO3
	b)	Define basic concepts of OOP and match them with one real time example.	5	CO3
Q.4	a)	Using C++ code show how can we achieve encapsulation and explain the importance of access specifies.	7	CO4
	b)	What is diamond problem? Is it possible to achieve it in programming, explain?	5	CO4
	c)	Discuss function overloading and overriding with proper code.	5	CO4
Q.5	a)	Justify depth first search and back tracking in prolog.	1	CO5
	b)	Write prolog clauses for a medical diagnosis.	2	CO5
Q.6		What is the difference between list and tuple in python?	3	CO6



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Institute: (0701)SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE

Programme: (070121) BACHELOR OF TECHNOLOGY

Specialization : Computer Science and Engineering,Information Technology

Batch: 2014-18,2015-19,2016-20

Semester: III

Course: Discrete Structures

Course Code: 0701220301CS,0701240301IT

Date: 19/11/2019

Maximum Marks: 60

Day: Tuesday

Time: 01:30 pm - 04:00 pm

- Instructions:**
- 1) All questions are compulsory.
 - 2) Draw neat diagrams if required.
 - 3) Assume suitable data if required.

- Q.1**
- a) Determine the power set $P(A)$ of the set $A = \{\emptyset, \{\emptyset\}\}$. 5 CO1
 - b) Show that $p \Leftrightarrow q = (p \vee q) \Rightarrow (p \wedge q)$ using
 - i) Truth table
 - ii) Algebra of proposition 4 CO1
- Q.2**
- a) Define injection and surjection. 4 CO2
 - b) Give an example of a relation which is symmetric and transitive but neither reflexive nor anti symmetric. 4 CO2
 - c) Prove by using Boolean algebra $a+b.c = (a+b).(a+c)$ 4 CO2
- Q.3**
- a) In a group of 8 boys and 5 girls, four children are selected. In how many different ways can they be selected such that at least one girl should be there? 4 CO3
 - b) In how many different ways can letters of the word 'POPULATION' will be arranged so that the vowels always come together? 5 CO3

Q.4 a) Consider a graph G with vertices $\{v_1, v_2, v_3, v_4\}$ and edges $(v_1, v_3), (v_1, v_4), (v_2, v_3)$. Which of the following are subgraphs of G?

- i) Graph G1 with vertex v_1 and edge (v_1, v_3)
- ii) Graph G2 with vertices $\{v_1, v_3\}$ and no edges
- iii) Graph G3 with vertices $\{v_1, v_2\}$ and edge (v_1, v_2)

Q.4 b) Explain Complete and Bipartite graph. 4 CO4

Q.5 a) Use Huffman coding to encode the following symbols with the frequencies listed :

L:0.3, M:0.1, N:0.2, O:0.15, P:0.36, Q:0.04

b) How many bits may be required for encoding the message 5 CO5
‘mississippi’?

Q.6 a) Show that a tree T with n vertices has $(n-1)$ edges. 4 CO6

b) List the properties of group. Explain with example. 5 CO6
