



# 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.

Institute : (0701) SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE  
Programme : (070122) BACHELOR OF TECHNOLOGY (CS)  
Batch : 2017-21,2019-23,2020-24,2021-25  
Semester : III  
Course Name : Discrete Mathematics and Probability Theory  
Course Code : 0701220301

Date: 07/12/2022  
Day: Wednesday

Maximum Marks: 60  
Time: 09:30 am to 12:00 pm

## Instructions:

1. All questions are compulsory
2. Write your seat number in word and figures in the answer sheet provided.
3. The use of non-programmable calculators is allowed.
4. Please note that the content of CO, BL and PI is for administrative purpose.

- Q.1 Out of 250 candidates who failed in an examination, it was revealed that 128 failed in Mathematics, 87 in physics, and 134 in aggregate. 31 failed in Mathematics and in Physics, 54 failed in the aggregate and in Mathematics, 30 failed in the aggregate and in Physics. Find how many candidates failed:
- Marks 6 CO/BL/PI 1/3/1.1.1
- (a) In all the three subjects.  
(b) In Mathematics but not in Physics.  
(c) In the aggregate or in Mathematics, but not in Physics.
- Q.2 Four boys (A, B, C, D) married to four girls (a, b, c, d). Find the stability of the following preferences.
- Marks 4 CO/BL/PI 2/2/2.1.1

Boy	Preferences			
A	c	b	d	a
B	b	a	c	d
C	c	a	d	b
D	c	a	d	b

Girl	Preferences			
a	A	B	D	C
b	C	A	D	B
c	C	B	D	A
d	B	A	C	D



- Q.3** Use mathematical induction to prove that:  $11^{n+2} + 12^{2n+1}$  is divisible by 133 for all  $n \in \mathbb{N}$ . 5      2/3/2.1.2
- Q.4** Prove that relation  $R$  on the set  $\mathbb{Z}$  of all integers defined by  $(x, y) \in R \Leftrightarrow x - y$  is divisible by  $m$ , is an equivalence relation on  $\mathbb{Z}$ . 3      3/3/2.1.2
- Q.5** Solve the recurrence relation  $a_n - 6a_{n-1} + 8a_{n-2} = n \cdot 4^n$ ,  $n \geq 2$  with boundary condition  $a_0 = 8$  and  $a_1 = 22$ . 5      3/3/2.1.3
- Q.6** Show that three cube roots of unity form a group with respect to multiplication. 5      4/3/1.1.1
- Q.7** If  $R = \{0, 1, 2, 3\}$ , then prove that  $(R, +_4, \times_4)$  is a ring, where  $+_4$  and  $\times_4$  respectively denote addition and multiplication modulo 4. 6      4/3/1.1.1
- Q.8**  $A$  and  $B$  throw alternatively with a pair of balanced dice.  $A$  wins if he throws a sum of six points before  $B$  throws a sum of seven points, while  $B$  wins if he throws a sum of seven points before  $A$  throws a sum of six points. If  $A$  begins the game, then find the probability of winning  $A$ . 4      5/2/1.1.2
- Q.9** A factory has two machines,  $A$  and  $B$ . Past records show that the machine  $A$  produces 30% of the total output and the Machine  $B$ , the remaining 70%. Machine  $A$  produces 5% defective items and Machine  $B$  produces 1% defective items. An item is drawn at random and found to be defective. What is the probability that it was produced by the machine  $A$ ? 5      5/2/1.1.2
- Q.10** The diameter of an electric cable, say  $X$ , is assumed to be continuous random variable with probability density function  $f(x) = 6x(1-x)$ ,  $0 \leq x \leq 1$ . 5      6/2/1.1.2  
Then (i) check  $f(x)$  is probability density function.  
(ii) determine the number  $b$  such that  $P(X < b) = P(X > b)$ .
- Q.11** Assume that 50% of all engineering students are good in mathematics. Determine the probabilities that among 18 engineering students (i) exactly 10, (ii) at most 8, (iii) at least 2 and at most 9 are good in mathematics. 6      6/2/1.1.2
- Q.12** The joint probability density function of two random variables  $X$  and  $Y$  is given as 6      6/3/1.1.2

$$f_{XY}(x, y) = \begin{cases} \frac{12}{7}(x^2 + xy), & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

Then (i) find  $p(X < Y)$ . (ii) find the marginal density  $f_Y(y)$ .

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Seat No.

**Institute** : (0701) SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE  
**Programme** : (070122) BACHELOR OF TECHNOLOGY (CS)  
**Batch** : 2017-21,2019-23,2020-24,2021-25  
**Semester** : III  
**Course Name** : Computer Organization  
**Course Code** : 0701220302

**Date** : 29/11/2022

**Day** : Tuesday

**Maximum Marks** : 45

**Time** : 9:30 am to 11:00 am

## Instructions:

1. All questions are compulsory
2. Write your seat number in word and figures in the answer sheet provided.
3. The use of non-programmable calculators is allowed.
4. Please note that the content of CO, BL and PI is for administrative purpose.

		Marks	CO/BL/PI
Q.1	a) Explain the use of Von Neumann machine architecture with diagram.	4	1/3/2.5.1
	b) Explain restoring division algorithm with flowchart.	5	1/1/2.5.2
Q.2	a) What are the significance of addressing modes? Discuss different modes.	6	2/1/2.8.4
	b) Find out the value of the 20-bit physical address of the memory when the content of the Code segment register(CS) is 2100H and the content of the instruction register (IP) is 0200H.	3	2/3/1.7.1
Q.3	a) Draw and discuss microprogrammed control unit.	6	3/3/2.5.2
	b) What are the differences between hardwired control and microprogrammed control?	3	3/2/2.6.4



Q.4	a) Explain difference between paging and segmentation.	4	4/4/2.6.4
	b) Discuss the components of memory hierarchy in computer.	5	4/2/2.6.4
Q.5	a) What is the importance of DMA? Explain its working.	6	5/3/2.5.2
	b) What are the major functions of an I/O module?	3	5/2/2.6.2

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Institute : (0701) SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE  
Programme : (070121) BACHELOR OF TECHNOLOGY (CSE)  
Batch : 2019-23, 2020-24, 2021-25  
Semester : III  
Course Name : Fundamentals of Data Structures  
Course Code : 0701220303

Date: 10/12/2022

Day: Saturday

Maximum Marks: 45

Time: 09:30 am to 11:00 am

## Instructions:

1. All questions are compulsory.
2. Write your seat number in words and figures in the answer sheet provided.
3. The use of non-programmable calculators is allowed.
4. Please note that the content of CO, BL, and PI is for administrative purpose.

		Marks	CO/BL/PI
Q.1	a) What is a function and mention how it is useful in C programming?	5	1/5/2.8.2
	b) State the different types of function call? Explain with example.	5	1/2/1.6.1
Q.2	a) Write algorithm for Selection sort and apply selection sort to following input and show passes. 77 33 44 11 88 22 66 55	5	2/3/2.5.1
	b) Write a function code to implement the Binary Search-iterative operation.	5	2/3/1.7.1
Q.3	a) Covert following expression from Infix to postfix. (A+B*C-D*)	5	3/5/2.5.1



- b) Write an algorithm to perform the following operations using Stack (any one) 5 3/1/3.7.1
- i) Well formedness of parenthesis
  - ii) Infix to prefix conversion
- Q.4 a) What are the Basic Operations of Queue? Explain any two with function code. 5 4/2/1.6.1
- b) Explain the concept of circular queue and describe the enqueue and dequeue() operations for circular queue. 5 4/2/2.5.1
- Q.5 What is use of pointer in file handling? Write C function to read from a text file using fscanf ( ). 5 5/5/3.5.1
- OR**
- Q.5 How to read the data from a binary file and write C function for reading from a binary file? 5 5/3/1.2.2

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Programme : (070122) BACHELOR OF TECHNOLOGY (CSE)  
Batch : 2019-23, 2020-24, 2021-25  
Semester : III  
Course Name : Programming Paradigms  
Course Code : 0701220305

Date : 03/12/2022  
Day : Saturday

Maximum Marks : 45  
Time: 09:30 am to 11:00 am

## Instructions:

1. All questions are compulsory
2. Write your seat number in words and figures in the answer sheet provided.
3. The use of non-programmable calculators is allowed.
4. Please note that the content of CO, BL and PI is for administrative purpose.

		Marks	CO/BL/PI
Q.1	Explain the characteristics of various programming paradigms.	5	1/2/1.3.1, 1.4.1
Q.2 a)	Show the memory representation of the following: struct my_struct { int a; char b; float c; }; union my_union { int a; char b; float c; };	3	2/3/1.4.1



- b) Write a C program to print the inverted pyramid pattern of \* using nested for loop concept: 5 2/3/3.4.2,4.2.1

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*****
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*

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- Q.3 a) Write a C++ program to design a class having static member function showcount() which has the property of displaying the number of objects created by the class. 5 3/3/3.4.2,4.2.1

- b) Write a C++ program to perform addition of two distance in the form of feet and inches using the concept of constructor overloading and friend function. 5 3/3/3.4.2,4.2.1

- Q.4 a) Write a C++ program to demonstrate overloading of << and >> operators using friend function. 6 4/3/3.4.2,4.2.1

- b) Explain inheritance and its types in detail. 6 4/3/1.6.1

OR

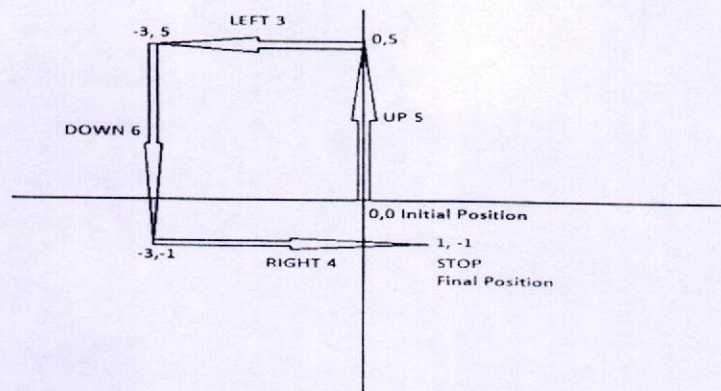
- Q.4 a) Write a C++ program to show the order of invocation of constructors and destructors in case of multilevel inheritance (consider 3 levels of inheritance). 6 4/3/3.4.2,4.2.1

- b) Explain polymorphism and its types in detail. 6 4/3/1.6.1

- Q5. a) Explain backtracking in Prolog with the help of an example. 2 5/2/1.4.1,1.1.1

- b) What is resolution in Prolog? Explain its use in theorem proving with example. 3 5/2/1.1.2, 2.8.1

- Q6. A robot moves in a plane starting from the original point (0,0) (refer the figure below). The robot can move toward UP, DOWN, LEFT, RIGHT and STOP with a given steps. The numbers after the direction are number of steps to move. Write a Python program to print final position of robot after a sequence of movements. (UP(+)/DOWN(-)=>Y Position, RIGHT(+)/LEFT(-)=>X Position). Accept command from the user in loop till user enters STOP command. 5 6/3/3.4.2,4.2.1



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Institute : (0701) SYMBIOSIS INSTITUTE OF TECHNOLOGY, PUNE  
Programme : (070122) BACHELOR OF TECHNOLOGY (CS)  
Batch : 2017-21, 2019-23, 2020-24, 2021-25  
Semester : III  
Course Name : Digital Electronics and Logic Design  
Course Code : 0701220307

Date : 05/12/2022  
Day : Monday

Maximum Marks : 45  
Time: 09:30 am To 11:00 am

## Instructions:

1. All questions are compulsory.
2. Write your seat number in word and figures in the answer sheet provided.
3. The use of non-programmable calculators is allowed.
4. Please note that the content of CO, BL and PI is for administrative purpose.

		Marks	CO/BL/PI
Q.1	a) Represent -99 and -77.25 in 8 bit 2's complement form.	2	1/3/2.2.3
	b) $(A2C)_{16} = (X)_8$ . then find the value of X.	2	1/3/2.2.3
	c) Add +55 to -55 using the 8 bit 1's complement method.	2	1/3/2.2.3
	d) Convert the following numbers with the given radix to binary.	4	1/3/2.2.3
	(i) $(4435)_5$		
	(ii) $(5654)_7$		
Q.2	a) Simplify the following	4	2/3/3.2.3
	(i) $\bar{X}\bar{Y} + XY + \bar{X}Y$		
	(ii) $\bar{A}B(\bar{D} + \bar{C}D) + B(A + \bar{A}CD)$		
	b) Show that $AB + \overline{(A + B)}$ is equivalent to $A \oplus B$ . Also construct the corresponding logic diagram.	3	2/3/3.2.3



- Q.3** a) Simplify the following using K- maps. **5** 3/3/ 2.2.3
- (i)  $F(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 9, 10, 12, 13)$
- (ii)  $F = \prod M(2, 8, 9, 10, 11, 12, 14)$
- b) Find the number of maxterm present in the **3** 3/3/ 2.2.3  
 $F(A, B, C, D) = \overline{B}D + \overline{A}D + BD$
- Q.4** a) Design 2-bit comparator using AOI logic. **5** 4/4/ 3.4.2  
 (Answer should include truth table and comparator implementation diagram).
- b) Design a BCD to Grey code converter. **5** 4/4/ 3.4.2  
 (Answer should include truth table and code converter implementation diagram).
- Q.5** a) Differentiate between combinational circuit and sequential **5** 5/4/ 2.2.4  
 circuit.
- b) Draw the symbols of JK and D flip-flops and write their truth **5** 5/1/ 1.4.1  
 table.

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