



Note: Answer ALL Questions

Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO												
<b>Unit-I</b>																	
1. a)	What is the probability that a card drawn at random from the pack of playing cards may be either a queen or a king	2	1	1	1												
1. b)	Calculate expectation of X, if the probability distribution of the random variable X is given by <table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>f</td> <td>0.3</td> <td>0.1</td> <td>0.1</td> <td>0.3</td> <td>0.2</td> </tr> </table>	x	-1	0	1	2	3	f	0.3	0.1	0.1	0.3	0.2	2	3	1	2
x	-1	0	1	2	3												
f	0.3	0.1	0.1	0.3	0.2												
<b>Unit-II</b>																	
1. c)	Solve for the values of n & p of the binomial distribution for which the mean is 4 and variance is 3	2	3	2	1												
1. d)	If a random variable has a poisson distribution such that $P(x=1) = P(x=2)$ find the Mean of the Poisson distribution.	2	1	2	2												
<b>Unit-III</b>																	
1. e)	Explain type I error	2	5	3	2												
1. f)	write the test statistic for large sample single mean	2	1	3	2												
<b>Unit-IV</b>																	
1. g)	Mention the first approximation of one of the roots $f(x) = 0$ by regula falsi method under the conditions that $f(a)$ & $f(b)$ have opposite signs and $a < b$	2	1	4	1												
1. h)	what is the condition for the convergence of successive approximation method	2	1	4													
<b>Unit-V</b>																	
1. i)	f (x) is given by <table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>0</td> <td>0.5</td> <td>1</td> </tr> <tr> <td>f(x)</td> <td>1</td> <td>0.8</td> <td>0.5</td> </tr> </table> Then use Trapezoidal rule to calculate $\int_0^1 f(x)dx$	x	0	0.5	1	f(x)	1	0.8	0.5	2	3	5	1				
x	0	0.5	1														
f(x)	1	0.8	0.5														
1. j)	What is the Simpsons 3/8 rule to evaluate $\int_a^b f(x)dx$	2	1	5	1												

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
2.a)	Of the 3 men the chances that a politician a businessman or an academician will be appointed as a vice chancellor of a university are 0.5, 0.3 , 0.2 respectively. Probability that research is promoted by these persons if they are appointed as vice chancellor are 0.3, 0.7, 0.8 respectively. If research is promoted, what is the probability that VC is an academician.	5	1	1	2
2.b)	Two aeroplanes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that i) target is hit ii) both fail to score hit	5	1	1	2
<b>OR</b>					
2. c)	A player wins if he gets 5 on a single throw of a die, he loses if he gets 2 or 4. If he wins, he gets ₹50, if he loses he gets ₹10, otherwise he has to pay ₹15. Find the value of the game to the player. Is the game favourable to the player?	5	1	1	2
2.d)	If a random variable has the probability density function $f(x) = k(x^2 - 1), -1 \leq x \leq 3.$ $= 0$ elsewhere	5	1	1	2

	Find the value of k and $p(1/2 \leq x \leq 5/2)$																		
3. a)	It has been claimed that in 60% of all solar heat installations the utility bill is reduced by at least 1/3. Accordingly, what are the probabilities that the utility bill will be reduced by at least 1/3 in i) four of five installations. ii) at least four of five installations.	5	1	2	2														
3. b)	It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 search tools a) 3% or more will be defective b) 2% or less will be defective	5	1	2	2														
<b>OR</b>																			
3. c)	The marks obtained in mathematics by 1000 students are normally distributed with mean 78% and standard deviation 11%. Find i) how many students got marks above 90% ii) what was the highest mark obtained by the lowest 10% of the students. iii) Within what limits did the middle 90% of the students lie.	5	1	2	2														
3.d)	Suppose 10% of the probability for a normal distribution $N(\mu, \sigma^2)$ is below 35 and 5% above 90. Solve for the values of $\mu$ and $\sigma$ .	5	3	2	1														
4. a)	An oceanographer wants to check whether the depth of the ocean in a certain region is 57.4 fathoms, as had previously been recorded. What can he conclude at the 0.05 level of significance, if readings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms.	5	1	3	2														
4. b)	The average marks scored by 32 boys is 72 with a standard deviation of 8. While that of 36 girls is 70 with a standard deviation of 6. Does this indicate that the boys perform better than girls at 0.05 level of significance.	5	2	3	2														
<b>OR</b>																			
4. c)	A manufacturer claims that only 4% of his products are defective. A random sample of 500 were taken among which 100 were defective. Test the hypothesis at 0.05 level of significance.	5	4	3	2														
4.d)	Random samples of 400 men and 200 women in a locality were asked whether they would like to have a bus stop near their residence. 200 men and 40 women were in favour of the proposal. Test the significance in the difference of opinion.	5	4	3	2														
5. a)	Solve the $x^3 + 2x^2 + 0.4 = 0$ using Newton Raphson method.	5	3	4	1														
5. b)	Using iteration method find a real root of $f(x)=x^2-3x+1$ correct up to 3 decimals starting with $x=1$ .	5	1	4	2														
<b>OR</b>																			
5. c)	Use gauss forward interpolation formula to find $f(3.3)$ from the following table <table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Y=f(x)</td> <td>15.30</td> <td>15.10</td> <td>15.00</td> <td>14.50</td> <td>14.00</td> </tr> </table>	x	1	2	3	4	5	Y=f(x)	15.30	15.10	15.00	14.50	14.00	5	3	4	1		
x	1	2	3	4	5														
Y=f(x)	15.30	15.10	15.00	14.50	14.00														
5.d)	Using Lagrange formula what is the value of $f(3)$ from the following table <table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>f(x)</td> <td>1</td> <td>14</td> <td>15</td> <td>5</td> <td>6</td> <td>19</td> </tr> </table>	x	0	1	2	4	5	6	f(x)	1	14	15	5	6	19	5	4	4	2
x	0	1	2	4	5	6													
f(x)	1	14	15	5	6	19													
6. a)	Evaluate $\int_0^\pi t \sin t dt$ using the Trapezoidal rule.	5	5	5	1														
6. b)	Evaluate $\int_0^1 \frac{1}{1+x} dx$ using simpsons 1/3 rule	5	5	5	1														
<b>OR</b>																			
6. c)	Solve the differential equation $\frac{dy}{dx} = x^2 + y$ , $y(0)=1$ by modified Euler's method and compute $y(0.02)$ and $y(0.04)$ .	5	3	5	1														
6.d)	Find $y(0.1)$ and $y(0.2)$ using Range-Kutta fourth order formula given that $\frac{dy}{dx} = x^2 - y$ and $y(0)=1$	5	1	5	2														

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome



**MAHATMA GANDHI INSTITUTE OF TECHNOLOGY**  
(Autonomous)  
**B.Tech. III Semester End Examinations**  
(Model Question Paper)

**MR-21**

**Course Title: Analog and Digital Electronics**  
Time: 3 hours

**Course Code: EC331ES**  
Max. Marks : 70

*Note: Answer ALL Questions*  
**Part-A (10 x 2 = 20 Marks)**

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
1. a)	What is meant by Zener Breakdown?	2	2	1	1
1. b)	What is diffusion capacitance?	2	1	1	1
<b>Unit-II</b>					
1. c)	Write any two differences between CB and CE configurations?	2	1	2	1
1. d)	What is the need of transistor biasing?	2	2	2	1
<b>Unit-III</b>					
1. e)	Write any two differences between BJT and JFET?	2	2	3	1
1. f)	Draw the diagram of CMOS NOT gate?	2	1	5	2
<b>Unit-IV</b>					
1. g)	Write the logic of half adder with Boolean functions?	2	1	4	2
1. h)	Draw the 4x1 multiplexer?	2	1	4	1
<b>Unit-V</b>					
1. i)	Define T Flip Flop with the help of characteristic equation?	2	1	4	1
1. j)	Differentiate Mealy Machine and Moore Machine?	2	2	4	2

**Part-B (5 x 10=50 Marks)**

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
2. a)	Explain the operation of PN Junction Diode with the help of VI characteristics?	5	2	1	1
2. b)	Draw the diagram of bridge rectifier and derive the efficiency and ripple factor?	5	3	1	2
<b>OR</b>					
2. c)	Explain the operation of Photo Diode with the help of VI characteristics?	5	2	1	1
2. d)	Compare half wave and full wave rectifiers?	5	3	1	2
<b>Unit-II</b>					
3. a)	Draw CB configuration of transistor and explain its input and output characteristics?	5	1	2	1
3. b)	Calculate operating point for the fixed bias circuit?	5	3	2	2
<b>OR</b>					
3. c)	Draw CE configuration of transistor and explain its input and output characteristics?	5	2	2	1
3. d)	Solve the expression for stability factor in voltage divider bias circuit?	5	3	2	2
<b>Unit-III</b>					
4. a)	Explain the JFET operation with the help of diagrams?	5	2	1	1
4. b)	Draw CMOS NOR gate and explain with neat diagram.	5	3	5	2
<b>OR</b>					
4. c)	Draw the Drain and Transfer characteristics of Depletion MOSFET and explain with neat diagrams?	5	2	1	1
4. d)	Realize XOR gate using NAND gates?	5	2	5	3

<b>Unit-IV</b>					
5. a)	Derive the logic expression for full adder with the help of truth table?	5	3	4	2
5. b)	Obtain minimal POS expression for the Boolean function. $F(A,B,C,D)=\Pi(0,1,2,3,4,6,9,10)+d(7,11,13,15)$ . draw the circuit using 2 input NAND gates	5	1	3	2
<b>OR</b>					
5. c)	Design 2 Bit Comparator and draw logic diagram?	5	3	4	3
5. d)	Explain the differences between canonical SoP and canonical PoS with suitable example	5	2	3	2
<b>Unit-V</b>					
6. a)	Draw the diagram of RS flip flop and explain the operation with truth table	4	2	4	2
6. b)	Design and develop Mod-10 Asynchronous counter using T- FlipFlop	6	6	4	3
<b>OR</b>					
6. c)	Design Mod 6 synchronous counter?	6	6	4	3
6. d)	Explain PISO shift register with the help of neat diagram	4	2	4	1

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**MAHATMA GANDHI INSTITUTE OF TECHNOLOGY**  
(Autonomous)  
**B.Tech. III Semester End Examinations**  
(Model Question Paper)

**MR-21**

Course Title: **Data Structures**  
Time: 3 hours

Course Code: **CS301PC**  
Max. Marks: 70

*Note: Answer ALL Questions*  
*Part-A (10 x 2 = 20 Marks)*

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
1. a)	Define a Data Structure. What are the different types of Data Structures?	2	1	1	1, 2
1. b)	Define ADT. Write the operations on data structures.	2	1	1	1, 2
<b>Unit-II</b>					
1. c)	Differentiate between Single Linked list and Doubly Linked list	2	2	2	1, 2
1. d)	Write the node structure in a Circular Linked list	2	2	2	1, 2
<b>Unit-III</b>					
1. e)	What is a Binary tree? Mention the tree traversals	2	1	3	1, 2
1. f)	Write the properties of Binary Search Tree.	2	2	3	1, 2
<b>Unit-IV</b>					
1. g)	Define a Graph. What are different Graph traversals?	2	1	4	1, 2
1. h)	Differentiate between Linear Search and Binary Search.	2	2	4	1, 2
<b>Unit-V</b>					
1. i)	Give example of Folding Hash method	2	2	5	1, 2
1. j)	What are the different collision resolution techniques?	2	1	5	1, 2

*Part-B (5 x 10=50 Marks)*

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
2.a)	Explain evaluation of postfix expression with an example	4	2	1	1, 2
2.b)	Write a C program for Queues using arrays.	6	3	1	3, 12
<b>OR</b>					
2.c)	What is stack? What are the basic operations associated with stack?	5	1	1	1, 2
2.d)	Convert following arithmetic infix expression into postfix by using stack : $A*(b + c) + (b/d) * a + z * u$	5	2	1	3, 12
<b>Unit-II</b>					
3.a)	Write the algorithm for insertion of a new node as last node in Doubly linked list.	4	2	2	3
3.b)	Implement insert() and delete() functions in Queues using Single linked list	6	3	2	3, 12
<b>OR</b>					
3.c)	Implement push() and pop() functions in Stacks using Single linked list	6	3	2	3, 12
3.d)	Write the algorithm for insertion of a new node as middle node in Single linked list	4	2	2	3
<b>Unit-III</b>					
4.a)	Construct a Binary Search tree using the elements 14,25,51,12,21,45,11,10	4	4	3	1, 2
4.b)	Construct a binary tree having the following traversal sequences: Preorder traversal: A B C D E F G H I Inorder traversal: B C A E D G H F I	6	4	3	1, 2
<b>OR</b>					
4.c)	Define a Binary Tree. Explain the Binary tree representations with an example	5	1	3	1, 2

4.d)	Write a brief note on Traversing a binary tree. Find the preorder and postorder traversal of following tree.				
	<pre> graph TD     Root[Root] --&gt; 40((40))     40 --&gt; 30((30))     40 --&gt; 50((50))     30 --&gt; 25((25))     30 --&gt; 35((35))     50 --&gt; 45((45))     50 --&gt; 60((60)) </pre>	5	2	3	3

**Unit-IV**

5.a)	Write Linear Search algorithm with an example	5	2	4	1, 2
5.b)	Distinguish between BFS and DFS	5	4	4	1, 2

**OR**

5.c)	Define a Graph. Explain Adjacency matrix representation of a Graph with an example.	4	1	4	1, 2
5.d)	Sort the following list of elements using Insertion sort 15,28,46,10,35,54,5,17	6	3	4	3, 12

**Unit-V**

6.a)	What is Hashing? Write about any hashing functions	5	1	5	1, 2
6.b)	What is collision? Explain linear probing with example	5	2	5	1, 2

**OR**

6.c)	Write about Double Hashing and Rehashing with examples	5	1	5	1, 2
6.d)	What is collision? Explain Quadratic probing with example	5	2	5	1, 2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome



*Note: Answer ALL Questions  
Part-A (10 x 2 = 20 Marks)*

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit – I</b>					
1. a)	Define computer organization, computer architecture.	2	1	1	1
1. b)	What is the difference between a direct and an indirect address instruction?	2	4	2	1
<b>Unit – II</b>					
1. c)	Define 8086 minimum and maximum mode.	2	1	4	1
1. d)	If the segment address is 1005H and the offset address is 5555H then what is the physical address?	2	3	4	2
<b>Unit – III</b>					
1. e)	What is an interrupt service routine in microprocessor?	2	2	3	4
1. f)	What is the difference between a macro and a procedure?	2	4	5	1
<b>Unit – IV</b>					
1. g)	Provide the hardware for signed-2's complement addition and subtraction.	2	3	1	2
1. h)	Differentiate isolated I/O and memory mapped I/O.	2	2	1	1
<b>Unit – V</b>					
1. i)	Explain the locality of reference.	2	2	2	1
1. j)	Draw the system bus structure for multiprocessors.	2	2	6	1

*Part-B (5 x 10=50 Marks)*

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit – I</b>					
2. a)	List the registers for the basic computer and give their functionality in program execution.	5	2	1	1
2. b)	Describe the micro programmed control organization and compare its advantages over hardwired control.	5	4	1	1
<b>OR</b>					
2. c)	Elucidate common bus system.	5	4	1	1
2. d)	Formulate a mapping procedure that provides eight consecutive micro instructions for each routine. The operation code has 7 bits and control memory has 4096 words.	5	6	2	2
<b>Unit – II</b>					
3. a)	Explain the register organization in 8086.	5	2	4	1
3. b)	Discuss the Physical memory organization.	5	2	2	1
<b>OR</b>					
3. c)	Does 8086 support instruction pipelining? Justify your answer with relevant example instructions.	5	4	3	1,2
3. d)	Discuss the physical address formation in different addressing modes.	5	3	4	1,2
<b>Unit – III</b>					
4. a)	Develop an assembly language program to find out numbers odd and even numbers in a given series of 16-bit hexa decimal numbers.	5	3	5	2
4. b)	What do you mean by a macro? What are the differences between a macro and a subroutine?	5	4	5	1,2,3
<b>OR</b>					
4. c)	Write a program to find out the number of positive numbers and negative numbers from a given series of signed numbers.	5	3	5	2
4. d)	Elaborate on the techniques used to pass parameters to procedures in assembly language program.	5	3	4	1,2
<b>Unit – IV</b>					
5. a)	Explain Booths multiplication algorithm with example.	5	3	3	1,2
5. b)	Compare interrupt driven data transfer scheme with DMA. Using block diagram explain interrupt driven transfer scheme.	5	4	1	1,3,4
<b>OR</b>					
5. c)	Explain arithmetic pipeline with example.	5	2	3	3,4
5. d)	Illustrate asynchronous communication interface in detail.	5	2	3	1
<b>Unit – V</b>					
6. a)	A digital computer has a memory unit of 64K * 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of 4 words. i. How many bits are there in the tag, index, block and word fields of the address format? ii. How many bits are there in each word of cache and how are they divided into function? Include a valid bit.	5	5	2	1,2,3
6. b)	Explain various Interconnection Structures.	5	4	6	1,3
<b>OR</b>					
6. c)	Give a neat sketch that illustrates the components in a typical memory hierarchy.	5	4	2	1,3
6. d)	Elucidate array processor in detail.	5	2	6	1,3



Course Title: C++ Programming

Time: 3 hours

Course Code: IT302PC

Max. Marks : 70

Note: Answer ALL Questions

Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
1. a)	Differentiate between OOP and procedure oriented programming.	2	4	5	1,2
1. b)	Explain structure of C++ program. With example	2	2	5	1
<b>Unit-II</b>					
1. c)	Illustrate class and object with suitable example.	2	3	5	1,3
1. d)	Define the following i) constructor, ii) parameterised constructor.	2	1	5	1
<b>Unit-III</b>					
1. e)	How reusability is implemented in oop.	2	2	1	1
1. f)	What is virtual base class.	2	1	1	1
<b>Unit-IV</b>					
1. g)	Define file stream.	2	1	3	1
1. h)	What is operator over loading	2	1	5	1
<b>Unit-V</b>					
1. i)	Define function template	2	1	4	1
1. j)	What is the importance of try, catch and throw keywords.	2	1	4	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
<b>Unit-I</b>					
2. a)	Explain jumping control structures in C++.	5	2	5	1
2. b)	Write a C++ program to add corresponding elements of two arrays and store them in a new array using pointers	5	3	5	1,2
<b>OR</b>					
2. c)	Explain operator precedence with example.	5	2	5	1
2. d)	With a suitable example explain NEW and DELETE operators	5	2	5	1
<b>Unit-II</b>					
3. a)	Explain friend class with suitable example program	5	2	5	1
3. b)	Differentiate constructors and destructors.	5	4	5	1
<b>OR</b>					
3. c)	What is the use of this pointer explain.	5	1	5	1
3. d)	Explain different types of constructors with example program.	5	2	5	1,3
<b>Unit-III</b>					
4. a)	Explain different forms of inheritance .give an example of each.	5	2	1	1,3
4. b)	Write a C++ program to demonstrate how access modifier of super class method can be changed in privately derived class	5	3	1	1,2,3
<b>OR</b>					
4. c)	Differentiate between early binding and late binding.	5	4	5	1,2
4. d)	Discuss about virtual function with example program.	5	1	1	1
<b>Unit-IV</b>					
5. a)	Write a C++ program to create a file of strings and to read the contents of a file line by line.	5	3	3	1,2,3
5. b)	Illustrate the use of perror()	5	2	3	1,3
<b>OR</b>					
5. c)	Write a C++ program to illustrate the use of ferror()	5	4	3	1
5. d)	With example explain operator over loading.	5	3	2	1
<b>Unit-V</b>					
6. a)	Write a C++ Program for exception handling using multiple catch statements	5	4	2	1,2
6. b)	Write a program for Bubble Sort using Template Functions.	5	3	5	1,2
<b>OR</b>					
6. c)	How STL is different from C++ standard library? Explain briefly the three foundational items of standard template library.	5	3	2	1
6. d)	Write a C++ program to add two integers, two floating point numbers and two complex numbers using class templates.	5	4	4	1,2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome