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

MR-21

Course Title: Mathematical and Statistical Foundations **Course Code: MA305BS**
Time: 3 hours Max. Marks: 70

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

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Solve the linear congruence $17x \equiv 14(mod 21)$	2	3	1	1
1. b)	Find the inverse of 7 $modulo$ 31 ie $7^{-1}(mod 31)$.	2	1	1	2
	Unit-II				
1. c)	Find the correlation coefficient r when $b_{xy} = 3.52$ and $b_{yx} = 4.23$,	2	1	2	1
1.d)	Find the regression equation X on Y is if $\bar{X} = 32, \bar{Y} = 42, b_{xy} = 0.5$.	2	1	2	2
	Unit-III				
1. e)	If a random variable has a poisson distribution such that P(x=1) = P(x=2). Find the Mean of the distribution.	2	1	3	2
1.f)	If a random variable X has the following probability function X = x: 1, 2, 3, 4, 5 P(X): 2k, 3k, 4k, 5k, 6k Find i) k ii)Mean	2	1	3	2
	Unit-IV				
1. g)	Define degree of freedom.	2	1	4	1
1.h)	If we can assert with 95% that the maximum error is 0.05 and P =0.2, find the size of the sample.	2	1	4	
	Unit-V				
1. i)	What is transition probability matrix.	2	1	5	1
1.j)	Is the matrix $A = \begin{bmatrix} 1 & 0 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ a stochastic matrix or not.	2	1	5	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2.a)	Solve : $3x + 4y \equiv 5(mod 13)$ $2x + 5y \equiv 7(mod\ 13$	5	3	1	2
2.b)	Solve the system of linear congruences $2x + 3y + z \equiv 3(mod\ 5)$ $x + 2y + 3z \equiv 1(mod\ 5)$ $2x + z \equiv 1(mod\ 5)$.	5	3	1	2
	OR				
2. c)	Factorize the number 23449 using Fermat factorization.	5	3	1	2
2.d)	Solve the system of linear congruences $x \equiv 1\ (mod\ 3),\ \ x \equiv 2\ (mod\ 5), x \equiv 3(mod 7)$.	5	3	1	2
	Unit-II				
3. a)	The two regression lines were found to be $4X - 5Y + 33 = 0$ and $20X - 9Y - 107 = 0$. Determine the mean values between X and Y.	5	3	2	2
3. b)	Find the regression equation of Y on X and estimate Y when X=55 from the following x: 40, 50, 38, 60, 65, 50, 35 y: 38, 60, 55, 70, 60, 48, 30	5	1	2	2
	OR				
3. c)	The equations of two lines of regression obtained in a regression analysis are the following $2X = 8 - 3Y$ and $2Y = 5 - X$. Calculate the value of the regression coefficients .	5	3	2	2

3.d)	Find the equation of the regression line of X on Y for the following data: x: 1 2 3 4 5 6 7 8 9 y: 4 8 2 12 10 14 16 6 18	5	1	2	1
	Unit-III				
4. a)	Suppose a continuous random variable X has the probability density function $f(x) = k(1-x^2) for\ 0 < x < 1$ and $f(x) = 0\ other\ wise$. Find (i) K (ii) Mean (iii) Variance	5	1	3	2
4. b)	A manufacturer of Cotter pins knows that 5% of his product is defective. Pins are sold in a boxes of 100. He guarantees that not more than 10 pens will be defective. What is the approximate probability that a box will fail to meet the guaranteed quality.	5	3	3	2
	OR				
4. c)	A player tosses 3 fair coins. He wins Rs.500 if 3 heads appear, Rs.300 if 2 heads appear, Rs100 if 1 head occurs. On the other hand, he loses Rs.1500 if 3 tails occur. Find the expected gain of the player.	5	1	3	2
4.d)	Out of 800 families with 5 children each, how many would you expect to have i) 3 boys ii) At least one boy iii) No girls	5	1	3	2
	Unit-IV				
5. a)	An ambulance service clains that it takes on average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and variance of 16 minutes. Test the claim at 0.05 level significance.	5	3	4	1
5. b)	The mean life of a sample of 10 electric bulbs was found to be 1456 hours with a standard deviation of 432 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with a standard deviation of 398 hours. Is there a significant difference between the means of two batches?	5	2	4	2
	OR				
5. c)	Before an increase on excise duty on tea 500 people out of a sample of 900 found to have the habit of having tea. After an increase on excise duty 250 are having the habit of having tea among 1100. Is there any decrease in the consumption of tea. Test at 5% level.	5	3	4	1
5.d)	A random sample of 10 boys had the following I.Q's : 70, 120, 110, 101, 88, 83,95, 98 107 and 100. Does this data support the assumption that the population mean IQ of 100?	5	2	4	2
	Unit-V				
6. a)	Find whether the following is a regular transition matrix $\begin{bmatrix} 0 & 0.5 & 0.5 \\ 0.5 & 0 & 0.5 \\ 0.5 & 0.5 & 0 \end{bmatrix}$	5	1	5	1
6. b)	Three boys A, B, C are throwing a ball to each others. A always throws the ball to B and B always throws the ball to C. But C is just as likely to throw the ball to B as to A. If C was the 1st person to throw the ball. Find the probability that (i) A has the ball (ii) B has the ball (iii) C has the ball after three throws.	5	1	5	1
	OR				
6. c)	A training process is considered as a two state Markov chain.If it rains, it is considered to be in state 0 and it does not rain, the chain is in the state of 1. The transition probability of the Markov chain is defined by P=$\begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$. Find the probability that it will rain for 3 days from today assuming that it is raining today. Assume that the mutual probabilities of state0 or state 1 as 0.4 and 0.6 respectively.	5	5	5	1
6.d)	A professor has three pet questions, one of which occurs on every test he gives. He never uses the same question twice in successive examinations. If he uses question number 1, he tosses a coin and uses question number 2,if he gets a head. If he uses question number 2, he tosses 2 coins and uses question number 3, if both are heads. If he uses question number 3, he tosses 3 coins and uses question number 1, if all are heads. In the long run, which question does he use most often and with how much frequency is it used.	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: **FUNDAMENTALS OF DATA STRUCTURES** **Course Code: CS302PC**
Time: 3 hours Max. Marks : 70

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

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define a Data Structure. What are the different types of Data Structures?	2	1	1	1, 2
1. b)	List out the advantages and disadvantages of using a linked list	2	1	1	1, 2
	Unit-II				
1. c)	Define Hashing. Write the importance of hashing.	2	2	2	1, 2
1. d)	What are the different collision resolution techniques?	2	1	2	1, 2
	Unit-III				
1. e)	Define binary tree. State the properties of a binary tree	2	2	3	1, 2
1. f)	What is mean by balanced trees? What are the categories of AVL rotations?	2	2	3	1, 2
	Unit-IV				
1. g)	What do you mean by internal and external sorting?	2	1	4	1, 2
1. h)	Define a Graph. What are different Graph traversals?	2	1	4	1, 2
	Unit-V				
1. i)	What is Pattern matching. List the Pattern matching Algorithms	2	1	5	1, 2
1. j)	Differentiate Compressed Tries and Suffix Tries	2	1	5	1, 2

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	What is stack? Write an algorithm for the basic operations of stack?	5	1	1	1, 2
2. b)	Write a C program for Queues using arrays.	5	3	1	3, 12
	OR				
2. c)	Convert following arithmetic infix expression into postfix by using stack : A*(B+ C) + (D/E) * F + H - I	5	2	1	3, 12
2. d)	Explain evaluation of postfix expression with an example	5	2	1	1, 2
	Unit-II				
3. a)	What is skip list. Explain the operations of the skip list representation with suitable examples.	5	2	2	1
3. b)	Write about Double Hashing and Rehashing with examples	5	1	2	1, 2
	OR				
3. c)	What is collision? Explain Quadratic probing with example	5	2	2	1, 2
3. d)	What is Hashing? Explain Extendable hashing technique with example.	5	1	2	1, 2
	Unit-III				
4. a)	Construct a Binary Search tree using the elements 43, 10, 79, 90, 12, 54, 11, 9, 50, 85, 100, 62	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
	OR				
4. c)	What is AVL Tree. Write the sequence of steps to construct AVL tree.	5	1	3	1, 2
4. d)	Construct AVL tree for the following data 21,26,30,9,4,14,28,18,15,10,2,3,7	5	2	3	3
	Unit-IV				
5. a)	Define a Graph. Explain Adjacency matrix representation of a Graph with an example.	4	1	4	1, 2
5. b)	What are the different graph traversing techniques explain with example.	6	3	4	3, 12
	OR				
5. c)	Write an algorithm for Heap sort.	4	2	4	3
5. d)	Write a C program for Merge Sort	6	2	4	3
	Unit-V				
6. a)	Write a Brute force pattern matching algorithm	5	1	5	1, 2
6. b)	What are tries and briefly explain their types.	5	2	5	1, 2
	OR				
6. c)	Explain Knuth-Morris-Pratt Algorithm with example.	6	1	5	1, 2
6. d)	Explain in detail about standard tries	4	2	5	1, 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: Python Programming **Course Code: CS305PC**
Time: 3 hours Max. Marks : 70

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

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	What is a variable? Write the rules for naming a variable.	2	1	1	2
1. b)	Differentiate between break and continue.	2	3	2	2
	Unit-II				
1. c)	Discuss Built-in functions and Methods in list with examples.	2	2	2	3
1. d)	What is a Dictionary? Demonstrate various Built-in functions and Methods in Dictionary.	2	3	2	3
	Unit-III				
1. e)	What is Exception handling? Tabulate Built-in Exceptions.	2	1	3	4
1. f)	Interpret a recursive function for finding factorial of a number in python.	2	2	2	
	Unit-IV				
1. g)	Summarize any 4 File module attributes	2	2	2	2
1. h)	Illustrate constructor.	2	2	2	2
	Unit-V				
1. i)	What is the purpose of Geometry method in python GUI.	2	1	5	5
1. j)	Demonstrate any 3 methods that can be used for arranging the widgets on window.	2	1	4	2

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Explain various Data Types in Python with examples.	5	2	1	1
2. b)	Build a Python program that reads four integers from user, prints them with a single print statement, without any space or newline between/after the values.	5	4	2	5
	OR				
2. c)	Illustrate the different types of Repetition Structures / control flow statements available in Python with flowcharts.	5	2	2	5
2. d)	Build a python script to print the following pattern. * * * * * * * * * *	5	4	2	5
	Unit-II				
3. a)	Classify between lists and tuples in Python.	5	2	2	2
3. b)	Illustrate Python script to find the square root of a number without using built-in functions.	5	2	3	5
	OR				
3. c)	Demonstrate Python sets.	5	1	2	2
3. d)	Explain about Python Dictionaries.	5	2	2	2
	Unit-III				
4. a)	Outline how to create, raise and handle user defined exceptions in python.	5	2	2	2
4. b)	What happens if except clause is written without any Exception type? Explain with an example.	5	1	3	5
	OR				
4. c)	What is Module in Python? Explain, how can you use Modules in your program explain with an example code.	5	1	2	2
4. d)	Explain different function prototypes with suitable examples.	5	2	3	5
	Unit-IV				
5. a)	Discuss the following methods associated with the file object a. read() b. readline() c. readlines() d. tell() e. seek()	5	4	2	5
5. b)	Discuss a program to demonstrate the Overriding of the Base Class method in the Derived Class.	5	4	4	2
	OR				
5. c)	Demonstrate implementation of hierarchical inheritance in Python, with a program.	5	2	4	2
5. d)	Outline Multiple Inheritance with Method Overriding with an example.	5	2	4	5
	Unit-V				
6. a)	How to use tkinter module? Write a python program to create a window with title	5	1	5	2
6. b)	Build a python program to display Tkinter Widgets Button and Label	5	4	5	2
	OR				
6. c)	Build a python program that creates a GUI with a text box, OK Button and QUIT button. On clicking OK the text entered in text box is to be printed in python shell, on clicking QUIT the program should terminate.	5	4	2	5
6. d)	Create a Calculator program in python for performing addition using tkinter widgets	5	6	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

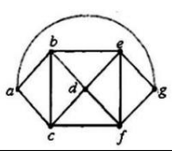
Course Title: Discrete Mathematics | **Course Code: CS306PC**
Time: 3 hours | Max. Marks : 70

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

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Explain different logical connectives in mathematical logic	2	2	1	1,2,3
1. b)	Verify the following formulas are well formed formulas are not? (i) P→(PVQ) (ii) (P→(~P)) →~P (iii) ((~Q ΛP) ΛQ)	2	3	1	1,2,3 ,4
	Unit-II				
1. c)	If A= {1,2,3}, B= {4,5} find i) AXB ii) BXA	2	3	2	1,2,3
1. d)	Prove that A-(B∩C) =(A-B) U(A-C)	2	3	2	1,3,4
	Unit-III				
1. e)	Differentiate between Mathematical Induction and Strong Induction	2	2	3	1,2,3
1. f)	Define Sum Rule and Product Rule.	2	1	3	1,3,4
	Unit-IV				
1. g)	Explain the principle of inclusion – exclusion?	2	2	4	1,2,3
1. h)	Solve the recurrence relation an= nan-1 for n≥1 where a0=1	2	3	4	1,3,4
	Unit-V				
1. i)	Define Spanning tree?	2	1	5	1,2,3
1. j)	Is K2,3 is a complete bipartite Graph?	2	2	5	1,3,4

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Show that ~p follows from the set of premises (r→~q), rVs, s→~q, p→q using indirect method of proof	5	3	1	1,2,3
2. b)	Show that the following implication without constructing truth table (i) (p→q) →q ⇒(pVq) (ii) p→q ⇒ p → p Λq	5	3	1	1,2,3,4
	OR				
2. c)	a) Rephrase the statement formula $(P \to (Q \wedge R)) \wedge (\neg P \to (\neg Q \wedge \neg R))$ as principal conjunctive normal form. Also define PCNF and PDNF.	5	3	1	1,2,
2. d)	b) "If there was a ball game, then traveling was difficult. If they arrived on time, then traveling was not difficult. They arrived on time. Therefore, there was no ball game." Show that these statements constitute a valid argument.	5	2	1	1,2,3,4
	Unit-II				
3. a)	Find all the properties that satisfies for the following algebraic systems under the binary operations 'X' and '+'. (a) Odd integer (b) All positive integers	5	2	2	1,2,3
3. b)	Draw the Hasse diagram for X ={2,3,6,24,36,48- and relation ≤} be such that x≤y, if x divides y.	5	3	2	1,3,4
	OR				
3. c)	Prove that a relation R on A is symmetric if and only if $R = R^{-1}$	5	2	2	1,2,3
3. d)	A function f is defined as $f(x)=2x-3$ on a set R of real numbers. Check whether the function f is bijective or not, if so, find inverse of the function. And hence compute $f^{-1}of$.	5	2	2	1,3,4
	Unit-III				
4. a)	Use mathematical induction to prove that **1 + 2 + 3 + ... + n = n (n + 1) / 2** for all positive integers n.	5	3	3	1,2,3
4. b)	Prove that $\mathbf{1^2 + 2^2 + 3^2 + ... + n^2 = n (n + 1) (2n + 1)/ 6}$ using mathematical induction for all positive integers n.	5	3	3	1,3,4
	OR				
4. c)	State Pigeon hole principle. Make use of it, find how many people were born on the same month among 200 people.	5	2	3	1,2,3
4. d)	How many bit strings of length 8 contain i. exactly five 1's ii. an equal number of 0's and 1's iii. at least four 1's iv. at least three 1's and at least three 0's	5	3	3	1,3,4

Unit-IV					
5. a)	How many ways can we distribute 14 indistinguishable balls in 4 numbered boxes so that each box is non empty.	5	2	4	1,2,3
5. b)	A group of 8 scientists is composed of5-psychologists and 3-sociologists, in how many ways can a committee of 5 be formed that has 3- psychologists and 2-sociologists.	5	2	4	1,3,4
OR					
5. c)	Solve the recurrence relation $a_{n+2} + 3a_{n+1} + 2a_n = 3^n \; for \; n \geq 0, \; a_0 = 0, a_1 = 1$	5	2	4	1,2,3
5. d)	Solve the recurrence relation $an - an-1 - 12an-2= 0$, $a0=0$, $a1 = 1$.	5	2	4	1,3,4
Unit-V					
6. a)	Define chromatic number of the graph. Write the chromatic number of complete graph, cycle graph, wheel graph, bipartite graph and regular graph.	5	1	5	1,2,3,4
6. b)	Differentiate Hamiltonian and Eulerian graphs.	5	2	5	1,3,4
OR					
6. c)	Make use of BFS algorithm to find a spanning tree of the following graph. Also explain BFS algorithm. 	5	3	5	1,2,3
6. d)	State and prove fundamental theorem of graph theory.	5	1	5	1,3,4

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: Computer Organization and Architecture **Course Code: CS308PC**
Time: 3 hours Max. Marks : 70

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

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Define computer organization and architecture.	2	1	2	1
1. b)	List out the logical micro-operation along with example.	2	1	1	1
	Unit-II				
1. c)	"Microprogrammed control unit organization slower the operation of computer" Justify	2	2	2	2
1. d)	Differentiate between ADD and ADDC instructions in computer.	2	2	1	2
	Unit-III				
1. e)	Convert $(235)_{10}$ = ( )$_2$	2	3	5	2
1. f)	Write the steps in floating point addition.	2	2	5	1
	Unit-IV				
1. g)	Classify the modes of data transfer.	2	1	3	1
1. h)	Give the role of associative memory in computer.	2	1	3	1
	Unit-V				
1. i)	Explain the significance of pipelining.	2	2	4	2
1. j)	What are the characteristics of multiprocessors.	2	1	4	1

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Explain the basic functional parts of the digital computer.	5	1	2	1
2. b)	Discuss about the common bus system configuration using multiplexer approach.	5	2	2	1
	OR				
2. c)	Differentiate between computer organization and architecture.	5	2	2	1
2. d)	Explain the memory-reference instruction with some RTL statements.	5	2	2	1
	Unit-II				
3. a)	With neat diagram, explain the operation of address sequencing in microprogram control organization.	5	1	1	3
3. b)	Explain the general register organization in digital computer.	5	1	1	1
	OR				
3. c)	Explain the basic blocks in micro programmed control organization.	5	1	1	1
3. d)	Discuss the various addressing modes in digital computer architecture.	5	1	1	1
	Unit-III				
4. a)	Perform X – Y when X = 1010101 and Y = 110011 using 2's complement approach.	5	3	5	2
4. b)	With neat diagram, explain the decimal arithmetic unit.	5	2	5	2
	OR				
4. c)	With the help example, explain the classification of fixed-point representation.	5	2	5	1
4. d)	Draw and explain the basic steps in Booth's multiplication algorithm.	5	3	5	3
	Unit-IV				
5. a)	With neat diagram, explain the role DMA in digital computer organization.	5	1	3	1
5. b)	Describe the various cache mapping techniques in cache memory organization.	5	1	3	2
	OR				
5. c)	Explain about input-out interfaces in digital computer.	5	1	3	1
5. d)	Draw and explain the memory hierarchy.	5	1	3	1
	Unit-V				
6. a)	Compare and contrast RISC versus CISC architectures.	5	2	4	5
6. b)	How to avoid the cache coherence problem in multiprocessor organization. Explain.	5	4	4	5
	OR				
6. c)	Explain about instruction pipelining.	5	1	4	12
6. d)	Give the significance of Array processors along with its applications.	5	2	4	12

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