

I M.Tech I Semester Supple. Examinations, March-2026

Sub Code: R24MCC101

RESEARCH METHODOLOGY & IPR

R24

Time: 3 hours

Max. Marks: 60

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Define research and explain its meaning and objectives in detail.	K2	1	6M
		ii) Outline the importance of hypothesis testing in research.	K2	1	6M
	OR				
	b	i) Explain the various motivations behind conducting research.	K2	1	6M
		ii) Enumerate the characteristics of the scientific method.	K2	1	6M
2	Unit-II				
	a	i) Define research design and explain its significance in research.	K2	2	6M
		ii) Explain the concept of exploratory research design with examples.	K2	2	6M
	OR				
	b	i) Explain the key features of a good research design.	K2	2	6M
		ii) Discuss the types of exploratory research design in detail.	K2	2	6M
3	Unit-III				
	a	i) Define sampling frame and its role in sampling.	K1	3	6M
		ii) Describe factors affecting sample size determination.	K1	3	6M
	OR				
	b	i) List characteristics of a good sample with examples.	K1	3	6M
		ii) Differentiate between probability and non-probability sampling techniques.	K2	3	6M
4	Unit-IV				
	a	i) Define intellectual property rights and explain their significance briefly.	K2	4	6M
		ii) List the different types of intellectual property rights.	K1	4	6M
	OR				
	b	i) Explain the main purposes and functions of trademarks.	K2	4	6M
		ii) Define trade secrets and their key characteristics briefly.	K2	4	6M
5	Unit-V				
	a	i) Define copyright law. Why is originality crucial for protection?	K2	5	6M
		ii) Discuss ownership issues in copyright law with examples.	K2	5	6M
	OR				
	b	i) Define patent law. Explain its importance for innovation.	K2	5	6M
		ii) Define industrial design and its importance in product development.	K2	5	6M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

I M.TECH I Semester Supple. Examinations, March-2026

Sub Code: R24MCS102 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Time: 3 hours

(CSE)

Max. Marks: 60

R24

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Show that $[(P \rightarrow Q) \rightarrow R] \rightarrow [(P \rightarrow Q) \rightarrow (P \rightarrow R)]$ is a tautology.	K3	1	6M
		ii) Predict $(\exists x) P(x) \wedge (\exists x) Q(x)$ and $(\exists x) (P(x) \wedge Q(x))$ are not logically equivalent.	K4	1	6M
	OR				
	b	i) State and explain the principle of duality in propositional logic. Using the principle of duality, derive the dual of $(P \vee Q) \wedge (\neg P \vee R)$.	K2	1	6M
		ii) Compare and contrast free and bound variables in predicate logic. Provide examples and explain their significance in logical statements.	K4	1	6M
2	Unit-II				
	a	i) Explain the different operations on sets with examples. Illustrate with Venn diagrams how the union and intersection of two sets work.	K2	2	6M
		ii) Explain how recursive functions are defined. Write a recursive function to compute the factorial of a number n and derive its output for n=5.	K3	2	6M
	OR				
	b	i) What are equivalence relations? Explain with an example how equivalence relations partition a set into equivalence classes.	K2	2	6M
		ii) Define a lattice and its properties. Prove that every finite lattice is bounded.	K2	2	6M
3	Unit-III				
	a	i) Evaluate the validity of the binomial theorem in deriving the number of subsets of a set with n elements.	K4	3	6M
		ii) Solve the recurrence relation $a_n = 3a_{n-1} - 2a_{n-2}$ with initial conditions $a_0 = 2$ and $a_1 = 5$.	K3	3	6M
	OR				
	b	i) If $P(n, 4) = 42 \times P(n, 2)$, write n?.	K3	3	6M
		ii) Write the coefficient of $x^{11} y^4$ in the expansion $(2x^3 + 3xy^2 + z^2)^6$ by using Multinomial theorem.	K3	3	6M
4	Unit-IV				
	a	i) Describe Eulerian and Hamiltonian graphs. What are the necessary and sufficient conditions for a graph to be Eulerian?	K2	4	6M
		ii) What are adjacency and incidence matrices in graph theory? Illustrate with an example of a graph with 4 vertices.	K2	4	6M
	OR				
	b	i) Construct six regular bipartite graphs along with description of vertex and edge sets respectively.	K3	4	6M
		ii) Compute that any 2 simple connected graphs with n vertices all of degree 2 are isomorphic.	K3	4	6M

5	Unit-V				
	a	i) Compare and contrast Prim's and Kruskal's algorithms for finding a minimum spanning tree with example.	K4	5	6M
		ii) Define a multigraph and a bipartite graph. Provide one example of each.	K2	5	6M
	OR				
	b	i) Explain BFS and DFS spanning trees with example.	K4	5	6M
		ii) State Euler's formula for planar graphs. Explain its significance with an example.	K2	5	6M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

I M.TECH I Semester Supple. Examinations, March-2026

Sub Code: R24MCS103 ADVANCED DATA STRUCTURES AND ALGORITHMS

Time: 3 hours

(CSE)

Max. Marks: 60

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M		
1	Unit-I						
	a	i)Explain about AVL Tree Creation and Deletion	K3	1	12M		
	OR						
	b	i) Write in detail about the Space and Time Complexity Analysis	K3	1	6M		
		ii) Write in detail about the importance of Asymptotic Notations	K3	1	6M		
2	Unit-II						
	a	i)Write about Breadth First Search Algorithm by considering a small example	K3	2	6M		
		ii)Explain the Merge sort with example	K3	2	6M		
	OR						
	b	i) Write in detail about Depth First Search Algorithm with example	K3	2	6M		
		ii) Derive the time complexity of Strassens Matrix Multiplication	K3	2	6M		
3	Unit-III						
	a	i) Explain the prims algorithm with example	K3	3	12M		
	OR						
b	i)Explain the Single Source Shortest Path algorithm with example	K3	3	12M			
4	Unit-IV						
	a	i)Solve the following instance of the 0/1 knapsack problem given the knapsack capacity in M=5 using dynamic programming and explain it.		K3	4	12M	
		Item	Weight				Profit
		1	4				10
		2	3				20
		3	2				15
		4	5				25
	OR						
b	i)Write about the importance of Dynamic Programming		K3	4	6M		
	ii)Write an Algorithm for All-Pair shortest path Algorithm.		K3	4	6M		
5	Unit-V						
	a	i)The N-queens problem is to place n-queens on an n x n chess board. What are the constraints in placing n-queens? Explain how backtracking can be used to solve the problem.		K4	5	6M	
		ii)Explain in detail about Branch and Bound		K4	5	6M	
	OR						
	b	i)Write in detail about Sum of Subsets problem with an example		K4	5	6M	
		ii)Discuss about Clique Decision Problem(CDP)		K4	5	6M	

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

I M.TECH I Semester Regular Examinations, March-2026

Sub Code: R24MCS104

BIG DATA ANALYTICS

Time: 3 hours

(CSE)

Max. Marks: 60

R24

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) What is SSH, and why is it essential for setting up a Hadoop cluster?	K2	1	6M
		ii) Describe the building blocks of Hadoop and their respective functions in a Hadoop cluster.	K2	1	6M
	OR				
	b	i) Compare the architecture and performance of Local (standalone) mode and Fully distributed mode in Hadoop.	K2	1	6M
		ii) Describe the transition process from Pseudo-distributed mode to Fully distributed mode in Hadoop.	K2	1	6M
2	Unit-II				
	a	i) Describe how a weather dataset can be used to demonstrate the functionality of MapReduce. Provide an example use case.	K4	2	6M
		ii) Compare the old and the new Java MapReduce APIs. Highlight their key differences and improvements in the new API.	K4	2	6M
	OR				
	b	i) Explain the concept of MapReduce and its role in processing large datasets in Hadoop.	K2	2	6M
		ii) How does the Hadoop framework handle data flow in a MapReduce job? Explain with a focus on the Mapper, Combiner, and Reducer phases.	K4	2	6M
3	Unit-III				
	a	i) What is Apache Spark, and how does it differ from Hadoop in terms of data processing and performance?	K4	3	6M
		ii) Define Resilient Distributed Datasets (RDDs) in Apache Spark. What are their key characteristics?	K2	3	6M
	OR				
	b	i) Discuss the role of Actions in Spark RDDs. Explain the purpose of collect(), count(), and reduce() actions with examples.	K4	3	6M
		ii) What is Persistence (Caching) in Apache Spark, and why is it important for RDDs? Explain with an example of how to cache an RDD.	K4	3	6M
4	Unit-IV				
	a	i) Explain the architecture of Apache Pig and its key components. How does it simplify data processing compared to writing MapReduce jobs?	K4	4	6M
		ii) Discuss the differences between Local Mode and Distributed Mode in running Pig scripts. What are the key use cases for each mode?	K4	4	6M
	OR				
	b	i) Compare the various interfaces provided by Apache Pig for scripting. Highlight the differences between the Grunt shell, PigServer, and embedded scripts.	K4	4	6M
		ii) What are some of the common operators in Pig Latin for transformations? Provide examples of using the FILTER, GROUP, and FOREACH operators in Pig scripts.	K2	4	6M

Unit-V					
5	a	i) Explain the architecture of Apache Hive and its components. How does Hive provide structure to Hadoop data?	K4	5	6M
		ii) How does the Hive Data Manipulation Language (DML) work? Provide examples of the LOAD DATA, INSERT INTO, and Create Table As Select (CTAS) commands.	K4	5	6M
	OR				
	b	i) Explain the concept of windowing in HiveQL. Provide an example of using windowing functions for analyzing data.	K2	5	6M
		ii) What are the different Hive clients available? Compare the CLI, JDBC/ODBC interfaces, and Beeline.	K4	5	6M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

I M.TECH I Semester Supple. Examinations, March-2026

R24

Sub Code: R24MCS109

INTERNET OF THINGS

Time: 3 hours

(CSE)

Max. Marks: 60

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 12M = 60M)

Q.No		Questions	KL	CO	M
1	Unit-I				
	a	i) Summarize the difference between IOT and M2M.	2	1	6M
		ii) Explain different Levels of IOT.	4	1	6M
	OR				
	b	i) Apprise Client-Server model with an example.	4	1	6M
		ii) Explain any two technologies that enable IOT with Examples.	4	1	6M
2	Unit-II				
	a	i) Illustrate smart cities with example and what device can be taken into consideration and how are they integrated.	4	2	6M
		ii) Choose a scenario using IOT, how would you derive functional and non-functional requirements.	3	2	6M
	OR				
	b	i) Sketch the domain model specification diagram for home automation.	3	2	6M
		ii) Infer how communication protocols ensure compatibility between devices? Explain any four communication protocols.	2	2	6M
3	Unit-III				
	a	i) Interpret the essential components of an IOT device and what are the key considerations while selecting IOT devices.	2	3	6M
		ii) Explain how data acquisition from sensors works in IOT systems. What are actuators and how do they differ from sensors in IOT devices?	4	3	6M
	OR				
	b	i) Exemplify some real-world examples of IoT applications built using BeagleBone or pcDuino? How do the computing capabilities of these devices (e.g., Raspberry Pi, Cubieboard) affect their IoT use cases?	2	3	6M
		ii) Determine the challenges developers face when integrating sensors and actuators with these devices (e.g., Raspberry Pi, Cubieboard)? How can developers optimize performance and power consumption in IoT devices?	3	3	6M
4	Unit-IV				
	a	i) Summarize cloud storage APIs and how they work ?	2	4	6M
		ii) Explain WAMP - Autobahn for IOT and WAMP session between client and router.	4	4	6M
	OR				
	b	i) Explain different types of cloud Storage and its advantages.	4	4	6M
		ii) Articulate what is Xively and how does it support IOT application? How does it differentiate itself from other IOT cloud platforms	3	4	6M
5	Unit-V				
	a	i) Sketch a high-level architecture for Smart Parking system.	3	5	6M
		ii) Explain in detail about using IOT for Green house control and smart irrigation.	4	5	6M
	OR				
	b	i) Explain two scenarios using IOT in Home Automation.	4	5	6M
		ii) Illustrate two scenarios using IOT in Smart Cities.	4	5	6M

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