Department of Information Technology

Mathematical Foundations of Computer Science

II B.Tech -I Sem

S.Divya
Asst. Professor

J.B.Institute of Engg & Technology

Yenkapally, Moinabad(Mandal)
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Results Target

Total Strength of the Class:

S. No	Class / Division	No. of Students
a.	**First Class with Distinction**	
b.	**First Class**	
c.	**Pass Class**	

Method of Evaluation

a.	**Internal Examination**	
b.	**Unit Wise Assignments**	
c.	**Descriptive Exam**	
d	**Objective**	
e.	**Final Examination**	

Course Objective: To learn and understand the concepts of Computer forensics

J.B.Institute of Engg & Technology

Department of Information Technology

Syllabus

Subject Name : MFCS Subject Code : 53022

Class : B.Tech II-Isem

Sl.No	Unit No:	Details of the unit
01	Unit I	Introduction to MFCS
		Statements and notations, connectives
		Well formed formulas
		Truth tables, tautology
		Equivalence implication , normal forms
		Quantifiers, universal quantifiers.
02	Unit II	Introduction to Predicates
		Predicative logic
		Free and bound variables
		Rules of inference
		Consistency
		Proof of contradiction
		Automatic theorem proving
03	Unit III	Properties of binary relations
		Equivalence ,transitive closure
		Compatibility and partial ordering relations
		Lattices , Hasse diagram
		Inverse function composition of functions
		Recursive functions
		Lattice and its properties
04	Unit IV	Algebraic systems examples and general properties
		Semi groups and monads
		Groups sub groups' homomorphism
		Isomorphism.

05	**Unit V**	Introduction to Elementary Combinatorics : Basis of Counting
		Combinations and Permutations
		With repetitions, Constrained repetitions
		Binomial Coefficients, Binomial multinomial theorems
		The principles of inclusion – Exclusion
		Pigeon hole principles and its applications
06	**Unit VI**	Introduction to Recurrence Relation
		Generating functions, function of sequences
		Calculating coefficient of generating function
		Recurrence Relation,
		Solving recurrence relation by substitution and generating funds,
		Characteristics roots solution of In homogeneous recurrence relation.
07	**Unit VII**	Introduction to Graph Theory
		Representation of Graph
		DFS , BFS
		Spanning tree
		Planar graphs
08	**Unit VIII**	Graph theory and applications
		Basic concepts Isomorphism and sub graphs
		Multi graphs and Euler circuits
		Hamiltonian graphs
		Chromatic numbers

Guidelines to Students

Where will this subject help?

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Books / Material

Text Books (TB)
TB1: Elements of DISCRETE MATHEMATICS- A computer oriented Approach-CLLiu, DP Mohapatra,Third Edition,Tata McGrawHill . **TB2:**. Mathematical Foundation Of Computer Science by Shahnaz bhathul

Suggested / Reference Books (RB)
RB1: Discrete Mathematics and its applications, Kenneth H.Rosen,Fifth Edition,TMH. **RB2:** Discrete Mathematics structures theory and applications, Malik & sen, cengage. **RB3:** Discrete Mathematics and its applications, Thomas Koshy,Elsevier.

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Department of Information Technology

SUBJECT PLAN :

Subject Name : **MFCS** Subject Code : 53022

Class : B.Tech II-Isem Faculty Name : S.Divya

Number of Hours / lectures available in this Semester / Year	**65**

Unit	Topic	Total No. of Hours
I	Introduction to MFCS	
	Statements and notations, connectives	
	Well formed formulas	
	Truth tables, tautology	
	Equivalence implication , normal forms	
	Quantifiers, universal quantifiers.	
II	Introduction to Predicates	
	Predicative logic	
	Free and bound variables	
	Rules of inference	
	Consistency	
	Proof of contradiction	
	Automatic theorem proving	
III	Properties of binary relations	
	Equivalence ,transitive closure	
	Compatibility and partial ordering relations	
	Lattices , Hasse diagram	
	Inverse function composition of functions	
	Recursive functions	
	Lattice and its properties	
IV	Algebraic systems examples and general properties	
	Semi groups and monads	
	Groups sub groups' homomorphism	

	Isomorphism.	
V	Introduction to Elementary Combinatorics : Basis of Counting	
	Combinations and Permutations	
	With repetitions, Constrained repetitions	
	Binomial Coefficients, Binomial multinomial theorems	
	The principles of inclusion – Exclusion	
	Pigeon hole principles and its applications	
VI	Introduction to Recurrence Relation	
	Generating functions, function of sequences	
	Calculating coefficient of generating function	
	Recurrence Relation,	
	Solving recurrence relation by substitution and generating funds,	
	Characteristics roots solution of In homogeneous recurrence relation.	
VII	Introduction to Graph Theory	
	Representation of Graph	
	DFS , BFS	
	Spanning tree	
	Planar graphs	
VIII	Graph theory and applications	
	Basic concepts Isomorphism and sub graphs	
	Multi graphs and Euler circuits	
	Hamiltonian graphs	
	Chromatic numbers	

J.B.Institute of Engg & Technology
Department of Information Technology

LESSON PLAN :

Subject Name : **MFCS** Subject Code : 53022

Class : B.Tech II-Isem Faculty Name : S.Divya

Unit I : COMPUTER FORENSIC FUNDAMENTALS
LEARNING OBJECTIVES: Deals with Fundamentals of Computer Forensic and Types in technology.

LECTURE PLAN:

Total no_ of classes: 11

Unit #	Topic as per JNTU syllabus	Lesson #	Suggested Books ** (Refer the list	Question Bank			Hand outs
				OQ	DQ	AQ	
Unit I	Introduction, Statements and notations	1	TB-1,2	1	1	A1	H1
	Connectives	1			1		
	Well formed formulas, Truth Tables	1					
	Problems on truth tables	1					
	tautology	1					
	Problems on tautology	1					
	equivalence implication	1					
	Normal forms.	1					
	Problems on normal forms	1					

OBJECTIVE QUESTIONS :
1.
2.

DESCRIPTIVE QUESTIONS :
1.
2.

ASSIGNMENT QUESTIONS:

1. (a) Show that R (PVQ) is a valid conclusion from premises PVQ, Q→R, P→M and ¬!M.
   (b) Construct truth table for(P →Q) Λ (R→Q)↔ (PVR)→ Q.
2. Show that the following statements is a tautology.
   ((PVQ) Λ(P →R) Λ (Q → R)) →R

UNIT-II : PREDICATES
LEARNING OBJECTIVES: learns about predicates logics and rules of inference.

LECTURE PLAN:
Total No_ of Classes: 06

S.No	Name of the Topic	Reference book code	No. of classes required
1	Introduction, Predicative logic	TB-1,2	1
2	Free & Bound variables and problems		1
3	Rules of inference		1
4	Consistency and problems		1
5	proof of contradiction		1
6	Automatic Theorem Proving		1

OBJECTIVE QUESTIONS :
1.
2.

DESCRIPTIVE QUESTIONS :
1.
2.

ASSIGNMENT QUESTIONS:

1. Explain the use of predicates with suitable examples.
2. Show that the following statements are logically equivalent without using truth table.
   ¬ P↔ Q ⇔ P↔¬ Q.

UNIT-III : RELATIONS

LEARNING OBJECTIVES: Learns about Relations, Lattices, Hasse Diagram, Inverse and Recursive functions.

LECTURE PLAN:

Total No_ of Classes: 09

S.No	Name of the Topic	Text/Reference book code	No. of classes required
1	Introduction , Properties of binary Relations	TB-1,2	1
2	Equivalence, transitive,closure		1
3	compatibility and partial ordering relations		1
4	lattices		2
5	Hasse diagram		2
6	Functions, inverse function		2
7	Composition of functions		1
8	Recursive functions		1
9	Lattice and its properties		2

OBJECTIVE QUESTIONS :

1.

2.

DESCRIPTIVE QUESTIONS :

1.

2.

ASSIGNMENT QUESTIONS:

1. Define the relation R on the set A of positive integers by (a,b) E R iff a/b can be expressed in the form 2^n. Where m is an arbitrary integer. Show that R is an equivalence relation.

2. Draw the Hasse diagram of $< x, \leq >$ where x={2,3,6,12,24,36} and the realtion $\leq$ be such that $x \leq y$ if x divides y.

UNIT-IV : ALGEBRAIC STRUCTURES

- **LEARNING OBJECTIVES:**Learns about Algebraic functions, homomorphism,Isomorphism.

LECTURE PLAN:
Total No_ of Classes: 06

S.No	Name of the Topic	Text/Reference book code	No. of classes required
1	Introduction,algebraic systems	TB 1,2	1
2	Examples and properties.		1
3	Semi groups		2
4	monads.		1
5	Groups and sub groups		1
6	Homomorphism,isomorphism.		1

OBJECTIVE QUESTIONS :

1.
2.

DESCRIPTIVE QUESTIONS :

1.
2.

ASSIGNMENT QUESTIONS:

1. If (G,*) and (H, Δ) are two groups and f: G→H isomorphism, then prove that The kernel of `f' is a normal subgroup.
2. Find all the properties that satisfies for the following algebraic systems under the Binary operations x and +.
   (a). Odd integers
   (b). All the positive integers.

UNIT-V: ELEMENTARY COMBINATORICS

- **LEARNING OBJECTIVES:** Learns about combinations & Permutations with repetitions.

LECTURE PLAN:
Total No_ of Classes: 06

S.No	Name of the Topic	Text/Reference book code	No. of classes required
1	Introduction , Basis of counting,	TB2	1
2	Combinations & Permutations		2
3	with repetitions, Constrained repetition		1
4	Binomial Coefficients,		1
5	Binomial Multinomial theorems		2
6	the principles of Inclusion – Exclusion.		1

OBJECTIVE QUESTIONS :

1.
2.

DESCRIPTIVE QUESTIONS :

1.
2.

ASSIGNMENT QUESTIONS:

1. Show that a graph G is self complementary if it has 4n or 4n+1 vertices (n is non negative integer).
2. Show that any simple graph with two or more vertices has at least two vertices of the same degree. (Hint : Use the Pigeon hole principle).

UNIT-VI: RECURRENCE RELATION

- **LEARNING OBJECTIVES:** Learns about recurrence relation,calculating coefficient of generating function and solving.

LECTURE PLAN:
Total No_ of Classes: 06

S.No	Name of the Topic	Text/Reference book code	No. of Lecture classes required
1	Introduction, Generating Functions	TB-2	1
2	Function of Sequences Calculating		2

	Coefficient of generating function		
3	Recurrence relations,		1
4	Solving recurrence relation by substitution and Generating funds		2
5	Characteristics roots solution of In homogeneous Recurrence Relation.		1
6	problems		1
7	Problems on relations		1

OBJECTIVE QUESTIONS :

1.

2.

DESCRIPTIVE QUESTIONS :

1.

2.

ASSIGNMENT QUESTIONS:

1. Solve the recurrence relation $a_n-7a_{n-1}+10a_{n-2}=4^n$
2. Solve the recurrence relation $a_n-4a_{n-1}+4a_{n-2}=(n+2)^2$. $a_0=0$, $a_1=1$

UNIT-VII: GRAPH THEORY.

- **LEARNING OBJECTIVES:** Learns about Representation of graph, DFS, BFS, Spanning tree.

- **LECTURE PLAN:**

Total No_ of Classes: 08

S.No	Name of the Topic	Text/Reference book code	No. of classes required
1	Introduction	TB-2	1
2	Representation of Graph		2
3	Representation of Graph		2
4	DFS		1
5	BFS		1
6	Spanning Trees		1
7	planar Graphs		1
8	problems		1

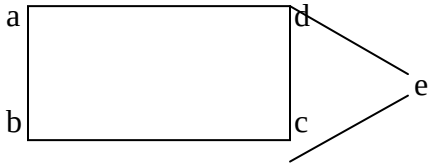
OBJECTIVE QUESTIONS :

1.

2.

DESCRIPTIVE QUESTIONS :
1.
2.

ASSIGNMENT QUESTIONS:
1. Explain the steps involved in deriving a spanning tree for the given graph using BFS algorithm



2Explain the algorithm of DFS traversal of a graph by giving a suitable example

UNIT VIII: GRAPH THEORY AND APPLICATIONS.

- **LEARNING OBJECTIVES:** Learns about sub graphs, Multi graphs and Euler graphs.

LECTURE PLAN:
Total No_ of Classes: 05

S.No	Name of the Topic	Text/Reference book code	No. of classes required
1	Graph Theory and Applications	TB-2	2
2	Basic Concepts Isomorphism and Sub graphs,		1
3	Multi graphs and Euler circuits		1
4	Hamiltonian graphs,		1
5	Chromatic Numbers.		1

OBJECTIVE QUESTIONS :
1.
2.

DESCRIPTIVE QUESTIONS :
1.
2.

ASSIGNMENT QUESTIONS:

1 Define the following terms. Give an example for each

i)Euler path ii)Euler circuit

iii)Multigraph iv)Hamiltonian graph

1. 2. Explain the following terms and determine the number of edges in

i)Complete graph ii)Complete biparite graph

Iii)Cycle graph iv)Path graph

DEPARTMENT OF INFORMATION TECHNOLOGY

INDIVIDUAL TIME TABLE

NAME OF THE FACULTY*:*

Period	1	2	3	4		5	6	7
Day/Time	9.10-10.00	10.00-10.50	10.50-11.40	11.40-12.30	L U N C H	01.00-1.50	1.5 0-2.40	2.40-3.30
Mon								
Tue								
Wed								
Thu								
Fri								
Sat								

Name of the Subject:

Total no of theory classes :

Total no of practical classes :

Total no of classes :

J. B.Institue of Engineering & Techology

II B.Tech -2009-Batch/I SEM (I-MID DESCRIPTIVE)

BRANCH: INFORMATION TECHNOLOGY

SUB:

TIME: 60 MINUTES **Marks: 10**

SECTION-A & B

Answer any TWO of the following: **(2x5=10M)**

1. xxxxxxxxxxxxxxx

a) xxxxxxxxxxxx

b) xxxxxxxxxxx

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c) xxxxxxxxxxxxxxxxxx

2. xxxxxxxxxxxxxxxxxx
   a) xxxxxxxxxxxxxxxx
   b) xxxxxxxxxxxxxxx
   c) xxxxxxxxxxxxx

3. xxxxxxxxxxxxxxxxxxx?

4. xxxxxxxxxxxxxxxs? xxxxx?

Marks for Internal Theory Examination

ROLL.NO	NAME OF THE STUDENT	I MID (Des+Obj+Assign))	II MID Des+Obj+Assign))

Computer forensics: QUESTION BANK 1 (Descriptive)-DQ1

1. Define Converse, Contra positive, Inverse of a conditional statement
2. Construct truth tables for
   i) [p->q] ∧[~p->q]
   ii) P->[~q∨r]
3. Are (p->q)->r and p->(q->r) logically equivalent or not? Verify using laws of logic and truth table
4. Prove by direct, indirect, proof by contradiction
   "If n is odd then n+11 is even"
5. Show that ⇒(~q∧(p->q))-> ~p

6. Define whether following relations are one-one, onto or both
   a) A={v, w, x ,y, z}, B={1, 2, 3, 4, 5}, R={(v,2),(w,1),(x,3),(y,5)}
   b) A={1, 2, 3, 4, 5}, B={1, 2, 3, 4, 5}, R={(1,2),(2,3),(3,4),(4,5),(5,1)}

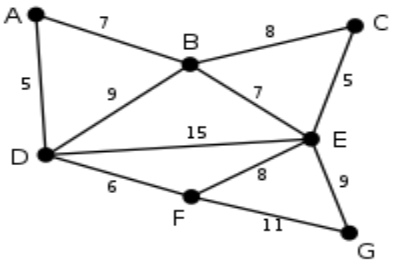
7. $f=x^2-2$, $g=x+4$. Find gof and fog. State they are one-one, onto or both

8. Explain the properties of binary relations
9. Write short notes on algebraic structure. Define Identity and Inverse

10. A) In how many ways 3 boys share 15 different sized apples if each take 5
    B) Find the arrangements of letters of MISSISSIPPI
11. A) Find the coefficient of x^9y^3 in the expansion of $(x+2y)^{12}$
    B) Find the coefficient of $x_1^2x_3x_4^3x_5^4$ in the expansion of $(x_1+x_2+x_3+x_4+x_5)^{10}$

12. Solve $a_n=3a_{n-1}$, $n\geq1$ using generating functions
13. Solve the recurrence relation of $a_n-7a_{n-1}+10a_{n-2}=0$ using generating functions

14. Find the minimal spanning tree for the given graph using prim's algorithm



15. Define the following graphs with 1 suitable examples for each graph
    i) Complement graph
    ii) Subgraph
    ii) Induced subgraph
    iv) Spanning subgraph

Computer forensics: QUESTION BANK 2 (Objective)-OQ1

1. **Find the number of subsets of A={2,2,2,3,3,5,11}.**

   a. 42
   b. 46
   c. 47
   d. 48

2. **Generating function of (n+2)(n+1) is**

   a. $1/(1-X)^2$
   b. $X/(1-X)^2$
   c. $2/(1-X)^2$
   d. $1/(1-3X)^2$

3. **Find a recurrence relation for the number of n-digit ternary sequences that have an even number of 0's.**

   a. $a_n = a_{n-1} + 3^{n-1}$
   b. $a_n = 2a_{n-1} + 2a_{n-2}$
   c. $a_n = a_{n-1} + 2a_{n-2}$
   d. $a_n = a_{n-1} - a_{n-2}$

4. **The maximum number of edges in a simple graph with n vertices is**

   a. n(n-1)/2
   b. (n-1)/2
   c. n(n+1)/2
   d. n(n-1)

5. Which is used to find the connected component of graph?

a. BFS
b. DFS
c. Simple Graph
d. d.Tree

6. A regular graph of degree _____ has no lines.

a. 0
b. 1
c. 2
d. 3

7. BFS stands for

a. Best First Search
b. Bid First Search
c. Breadth First Search
d. Bi First Search

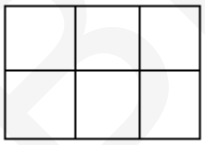
8. A graph having loops but no multiple edges called a

a. Simple graph
b. multigraph
c. pseudo graph
d. weighted graph

9. The value of n!/(n-1)! Is

a. n
b. n!
c. n*n
d. (n-1)!

10. Count the number of regions in the following graph



a. 5
b. 7
c. 9
d. 11

11. Eular's rule is

a. v+e+r=2
b. v-e+r=2
c. v-e-r=2
d. v+e-r=2

12. A graph G=(V,E) is called a _____ graph if its vertices V can be partitioned into two subsets V1 and V2 such that each edge of G connects a vertex of V1 to a vertex of V2.

a. simple
b. bipartite
c. complete bipartite
d. multi graph

13. A planar graph has only ___ infinite region(s).

a. one
b. two
c. three
d. four

14. If G is a simple graph with n vertices and k components, then G can have at most ___ edges.

a. (n-k)(n+k+1)/2
b. (n-k)(n-k+1)/2
c. (n+k)(n+k+1)/2
d. (n-k)(n-k-1)/2

15. Two graphs G1 and G2 are called _____ graph if there is a one-to-one correspondence between their vertices and between their edges.

a. Homeomorphic
b. isomorphic
c. complete
d. planar

16. The number of edges that must be removed before a spanning tree is obtained with n vertices and m edges must be

a. m-n+1
b. m+n+1
c. m-n-1
d. m+n-1

17. A given connected graph is a Eular graph if and only if all vertices of G are of

a. same degree
b. even degree
c. odd degree
d. d. different degree

18. An ____ is a graph that possesses a Eular circuit.

a. Eular path
b. Eular circuit
c. Eular graph
d. Eular region

19. Commutative law is

a. A U B = B U A
b. A = A
c. (A U B) U C = A U (B U C)
d. B = B

20. A circuit in a connected graph which includes every vertex of the graph is known as

a. Eular
b. Universal
c. Hamiltonian
d. Clique