	GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY **(AN AUTONOMOUS INSTITUTION)** **(Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu)** **(Accredited byNAACwith"A"Grade, NBA (EEE,ECE & ME)&ISO9001:2008CertifiedInstitution)**

QUESTION BANK (DESCRIPTIVE – 12 MARKS)

Subject Name with Code: Discrete Mathematical Structures---22A0017T
Course & Branch: B. Tech & Common to CSE,AIML,CS,DS
Year& Semester: II B. Tech II Semester **Regulation:** RG22

Q.No.	UNIT-I (Mathematical Logic)	[BT Level][CO][Marks]
1.	a) Compute the truth value of $[(P \vee Q) \wedge (\sim R)] \leftrightarrow Q$ using truth table (6m) b) Solve the principal disjunctive and conjunctive normal forms of $(P \rightarrow (Q \wedge R)) \wedge (\neg P \rightarrow (\neg Q \wedge \neg R))$ using Truth table.	[3][CO1][6] [3][CO1][6]
2.	a) Explain Well Formed Formula and Tautology with examples? (6m) b) List all the basic connective in detail with examples? (6m)	[2][CO1][6] [1][CO1][6]
3.	a) Calculate the PCNF of $(\sim p \leftrightarrow r) \wedge (q \leftrightarrow p)$ using truthtable? (6m) b) Solve the disjunctive Normal form of $\sim(p \rightarrow (q \wedge r))$ using truthtable? (6m)	[3][CO1][6] [3][CO1][6]
4.	a) Show that $((P \rightarrow R) \vee (Q \rightarrow R)) \leftrightarrow ((P \wedge Q) \rightarrow R)$ is tautology without using truth table? (8m) b) Explain about Tautological Implication? (4m)	[3][CO1][8] [2][CO1][4]
5.	a) Show that $\neg (P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$ (6m) b) Show that $(P \vee Q) \wedge (\neg P \wedge (\neg P \wedge Q)) \Leftrightarrow (\neg P \wedge Q)$ (6m)	[3][CO1][6] [3][CO1][6]
6.	Show that for any propositions p,q,r the compound proposition $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology.	[3][CO1][12]
7.	a) Show that $(P \wedge (P \vee Q)) \longrightarrow Q$ is a tautology without using truth table(6m) b) Explain in brief about duality Law? (6m)	[3][CO1][6] [2][CO1][6]

8.	a) Explain the steps involved in mathematical induction?(4m) b) Solve 1.2+2.3+3.4+……..+n.(n+1)=(n(n+1)(n+2))/3 using the mathematical induction for all n>=1(8m)	[2][CO1][4] [3][CO1][8]
9.	a) Descibe converse, contrapositive and inverse of an implication? (6m) b) Show that $(p\rightarrow q) \rightarrow q = p \vee q$ without constructing the Truth Table? (6m)	[1][CO1][6] [3][CO1][6]
10.	Solve the PCNF and PDNF for PV (~P-> (QV (Q -> ~R))) using truth tables?	[3][CO1][12]

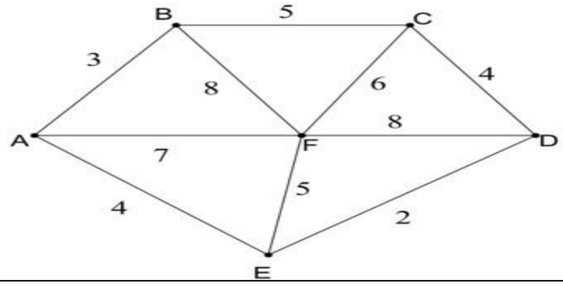
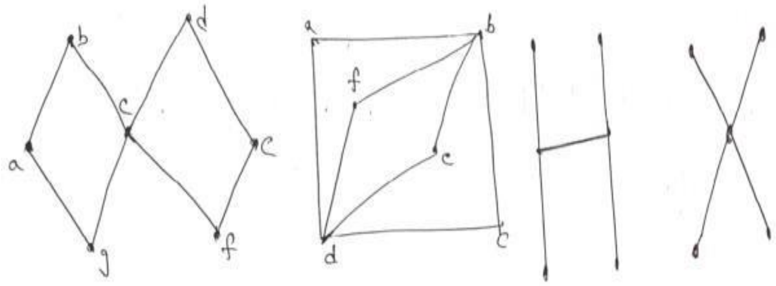
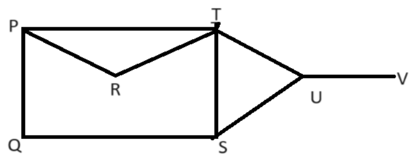
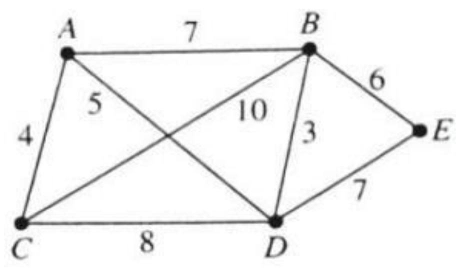
Q.No.	**UNIT-II** **(Set theory)**	**[BT Level][CO][Marks]**
1.	Show that $(S,\leq)$ is a Lattice, where S= {1,2,5,10} and $\leq$ is for divisibility. Prove that it is also a Distributive Lattice?(12m)	[3][CO2][12]
2.	Compute the given data using Principle of Inclusion and Exclusion: In A survey of 100 students, it was found that 30 studied Mathematics, 54 studied Statistics, 25 studied Operations Research, 1 studied all the three subjects, 20 studied Mathematics and Statistics, 3 studied Mathematics and Operations Research and 15 studied Statistics and Operation Research. a) Determine how many students studied none of these subjects b) Determine how many students studied only Mathematics? (12m)	[3][CO2][12]
3.	Let G { 0,1, 2, 3, 4,5} i. Construct the Composition Table with respect to ‘+6’ (Addition Modulo 6) ii. Show that "G” is an Abelian Group iii. Compute the inverse of each and every element in G. iv. Calculate the order of each and every element in a Group (12m)	[3][CO3][12]
4.	a) Compute the value of f(2, 4) for function f(x, y) = x + y is primitive recursive. (6m) b) Explain atleast 3 types of functions with suitable	[3][CO3][6] [2][CO3][6]

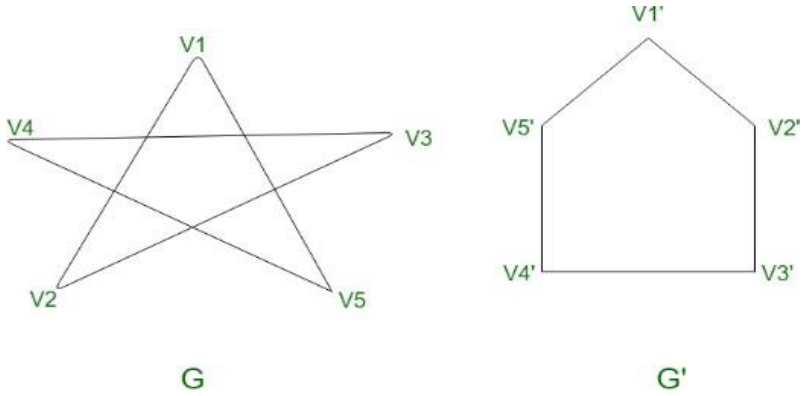
	examples?(6m)	
5.	Let A={1,2,3,4,6,12} on A define the relation R by aRb if and only if a divides b. a) show that R is a partial order on A?(8m) b) construct the Hasse Diagram for this relation?(4m)	[3][CO3][8] [3][CO3][4]
6.	Solve the inverse of the following functions with the proper steps: a) X={1,2,3},Y={p,q,r},and F={(1,p),(2,r),(3,q)} (4m) b) F(x)=(3x+2)/(2x+1) (4m) c) F(x)=sqrt(x+4)-3 (4m)	[3][CO3][4] [3][CO3][4] [3][CO3][4]
7.	a) Let X = {1, 2, 3} and f, g, h and s be the functions from X to X given by f = {(1, 2), (2, 3), (3, 1)} g = {(1, 2), (2, 1), (3, 3)} h = {(1, 1), (2, 2), (3, 1)} s = {(1, 1), (2, 2), (3, 3)} Solve g ∘ f; f ∘ h ∘ g; s ∘ g.(6m) b) Describe Partition and Covering of a Set with suitable set of examples for satisfying and not satisfying conditions for the definition? (6m)	[3][CO3][6] [1][CO3][6]
8.	Let X={1,2,3,4,5,6,7} and R={(x, y /x-y is divisible by 5} in x. Show that R is an equivalence relation.(12m)	[3][CO3][6]
9.	a) Define pigeon hole principle and what is the minimum no.of students required in a class to be sure that atleast 6 students will receive the same grades if there are 5 grades(A,B,C,D,E,F)?(4m) b) Explain composition of functions? Let f and g be functions from R to R, where R is a set of real numbers defined by f(x) = x^2 + 3x + 1 and g(x) = 2x − 3. Interpret the composition of functions: i) f ∘ f ii) f ∘ g iii) g ∘ f.(8m)	[1][CO3][4] [2][CO3][8]
10.	For a fixed integer n>1,show that the relation “congruent modulo n” is an equivalence relation on the set of all integers, Z.(12m)	[3][CO3][12]

Q.No.	**UNIT-III (Elementary Combinatorics)**	**[BT Level][CO][Marks]**
1.	From a committee consisting of 6 men and 7 women, Compute in how manyways can be select a committee of a) 3men and 4 women. b) 4 members which has atleast one women. c) 4 persons of both sexes. d) 4 person in which Mr. And Mrs kannan is not included	[3][CO4][12]
2.	In a town council there are 10 democrats (6 men, 4 women) and 11 republicans (7 men, 4 women). Find the number of committees of 8 councilors which have equal number of men and women and equal number of members from both parties	[3][CO4][12]
3.	Calculate the coefficients using Multinomial Theorem: I. $x^5y^5z^5w^5$ in $(x-3y+2z-5w)^{20}$ II. xyz^2 in $(2x-y-z)^4$	[3][CO4][6] [3][CO4][6]
4.	Calculate the coefficients using Binomial Theorem: (i) $a^2b^3c^2d^4$ in $(a+b)^5(c+d)^6$ (ii) a^3b^2 in $(a+b)^5+(c+d)^4$. (ii) X^3Y^7 in (i) $(X+2Y)^{10}$ (ii)$(2X-9Y)^{10}$	[3][CO4][6] [3][CO4][6]
5.	Compute the number of ways in which the complete collection of letters thatappear in TALLAHASSEE can be arranged in a row so that: (i) T appears at the beginning and E appears at the end. (ii) There are no adjacent A's	[3][CO4][12]
6.	I. Calculate the coefficient of $x^5y^{10}z^5w^5$ $(x-7y+3z-2w)^{25}$ II. How many non-negative integral solutions are there to the inequality $x1 + x2 + x3 + x4 + x5 <= 19$.	[3][CO4][6] [1][CO4][6]
7.	If two indistinguishable dice are rolled, then Compute in a) How many ways can we get a sum of 4 or of 8? b) How many ways we get an even sum?	[3][CO4][6] [3][CO4][6]
8.	Calculate the number of ways in which the complete collection of letters thatappear in MISSISSIPPI can be arranged in a row so that: (i) S appears at the beginning (ii) There are no adjacent I's	[3][CO4][12]

Q.No.	UNIT-IV (Recurrence Relations)	[BT Level][CO][Marks]
1.	Solve recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$?	[3][CO5][12]
2.	Find Fibonacci recurrence sequence that satisfy the recurrence relation $f_n = f_{n-1} + f_{n-2}$ with initial conditions $f_0 = 0$ and $f_1 = 1$.	[1][CO5][12]
3.	Solve recurrence relation $a_n = 6a_{n-1} – 9a_{n-2}$ with $a_0 = 1$ and $a_1 = 6$?	[3][CO5][12]
4.	Compute the Coefficient of a Generating Function I. x^{12} in $x^3(1-2x)^{10}$ II. x^0 in $(3x^2-(2/x))^{15}$	[3][CO5][12]
5.	i. Solve recurrence relation $4a_n-3a_{n-1}=0$, $n \geq 1$, $a_0=1$ ii. If a_n is the solution of a recurrence relation $a_{n+1}=k.a_n$ and $a_3=153/49$ and $a_5=1377/2401$. What is k?	[3][CO5][6] [1][CO5][6]
6.	Solve the *recurrence relation* $a_n– 3 a_{n-2} + 2 a_{n-3}= 0$, $n \geq 3$, $a_0 = 1$, $a_1 = 0$, and $a_2 = 0$ using *character root functions*	[3][CO5][12]
7.	Solve the following Recurrence relation by Substitution method.i. $a_n=a_{n-1}+(1/n(n+1))$ where $a_0=1$ ii. $a_n=a_{n-1}+n.3^n$ given $a_0=1$	[3][CO5][6] [3][CO5][6]
8.	Calculate the coefficient of x^{27} in the following function $(x^4+x^5+x^6+……)^{5.}$	[3][CO5][12]
9.	i. Find the sequence of Generating Function $(3+x)^3$. ii. Find the generating function for the sequence 0,1,-2,3,-4,…..	[3][CO5][6] [3][CO5][6]
10.	Solve the recurrence relation $2a_{n+3} = a_{n+2} + 2a_{n+1} - a_n$ with $a_0 = 0, a_2=2$ and $a_1 = 1$?	[3][CO5][12]

Q.No.	UNIT-V (Graphs)	[BT Level][CO][Marks]
1.	Show that the maximum number of edges in a simple graph with n vertices is $n*(n−1)/ 2$	[3][CO6][12]
2.	sketch all regular binary trees: (i) With exactly 7 vertices. (ii) With exactly 9 vertices. 5M	[4][CO6][12]
3.	I. Write Kruskal's algorithm for finding a minimal spanning tree. II. Compute the value of minimum spanning tree using Kruskal's algorithm	[1][CO6][4]

		[3][CO6][8]
4.	I. Explain about Euler circuit, Euler walk, Euler graph II. Explain about Hamiltonian circuit, Hamiltonian walk, Hamiltonian graph III. Test whether the following graphs are Euler or Hamiltonian. 	[2][CO6][4] [2][CO6][4] [3][CO6][4]
5.	1. Explain Euler's Formula or Euler's Theorem? 2. For the given planar graph shown below,  a) Apply Euler's formula and find the degree of each region. b) Show that sum of these degrees is equal to the twice the no.of edges. c) Show that following graph is verified by Euler's formula.	[2][CO6][3] [3][CO6][3] [3][CO6][3] [3][CO6][3]
6.	1. Explain minimum spanning tree. 2. Build a minimum spanning tree of the following graph with proper steps.  3.	[2][CO6][3] [3][CO6][3]

7.	i. List the conditions involved in Isomorphism of two graphs ii. analyze whether the given graphs are isomorphic to each other or not? 	[1][CO6][4] [4][CO6][8]
8.	I. Explain Graph Coloring and Chromatic Number of a graph with examples. II. Sketch Petersen graph(10 vertices,15 edages) and Herschel graph(11 vertices,18 edges) with proper graph Coloring and find the chromatic number for each graph.	[2][CO6][4] [4][CO6][8]

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QUESTIONBANK (2 Marks)

Subject Name with Code: Discrete Mathematical Structures---22A0017T
Course & Branch: B. Tech & Common to CSE,AIML,CS,DS
Year& Semester: II B. Tech I Semester **Regulation:** RG22

Q.No.	UNIT-I (Mathematical Logic)	[BT Level][CO][Marks]
1.	What is tautology? Give some examples for it?	[1][CO1][2]
2.	Explain WFF and duality with examples?	[2][CO1][2]
3.	Describe converse, contrapositive and inverse of an implication?	[1][CO1][2]
4.	Explain about PDNF with examples?	[2][CO1][2]
5.	What is duality law? Give suitable example?	[1][CO1][2]
6.	Compute the Truth value for ~(~p^~q) using truth table?	[3][CO1][2]
7.	Explain the steps involved in mathematical induction?	[2][CO1][2]

Q.No.	UNIT-II (Set theory)	[BT Level][CO][Marks]
1.	Define a relation and PoSet.	[1][CO2][2]
2.	Define a homomorphism with example.	[1][CO3][2]
3.	State the Pigeonhole principle.	[1][CO2][2]
4.	Define semigroup and monoid. Give an example of a semigroup which is not a monoid	[1][CO3][2]
5.	Define inverse function with example?	[1][CO2][2]
6.	Define Lattices and two Properties?	[1][CO2][2]
7.	Explain digraph with example.	[1][CO2][2]
8.	Explain any 4 basic concepts of set theory.	[1][CO2][2]

Q.No.	UNIT-III (Elementary Combinatorics)	[BT Level][CO][Marks]
1.	State the Multinomial theorem.?	[1][CO4][2]
2.	State binomial theorem?	[1][CO4i][2]
3.	In how many ways can 6 persons occupy 3 vacant seats?	[1][CO4][2]
4.	Differentiate between permutation and combination?	[2][CO4][2]
5.	Explain sum rule?	[1][CO4][2]
6.	Explain Product rule?	[1][CO4][2]
7.	Suppose a person has 5 shirts and 7 ties. How many ways a person can choose a shirt and a tie.	[1][CO4][2]
8.	Compute how many ways for selecting a prime number less than 10 or even number less than 10.	[3][CO4][2]

Q.No.	**UNIT-IV** **(Recurrence Relations)**	**[BT Level][CO][Marks]**
1.	Compute the recurrence relation of the Fibonacci sequence.	[3][CO5][2]
2.	Compute the sequence generated by the recurrence relation. $T_n=3.T_{n-1}-4$ with $T_1=3$.	[3][CO5][2]
3.	Compute the recurrence relation for the following sequence. 1,3,6,10,15,21,….	[3][CO5][2]
4.	Define Order and Degree with example.	[1][CO5][2]
5.	Calculate the closed form of the generating function for the sequence "s" withterms 1,2,3,4……..	[3][CO5][2]

Q.No.	**UNIT-V** **(Graphs)**	**[BT Level][CO][Marks]**
1.	Define chromatic number? Give suitable example	[3][CO5][2]
2.	Explain Euler formula? Give suitable example	[3][CO5][2]
3.	Define Bipartite graph? Give suitable example	[3][CO5][2]
4.	Define Binary tree? Give suitable example	[1][CO5][2]
5.	Explain Four colours theorem? Give suitable example	[3][CO5][2]
6.	When do you say that a graph is minimally connected?	[1][CO5][2]
7.	Define a planar graph.? Give suitable example.	[1][CO5][2]

Prepared By : (______________________