SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

II B. Tech II Sem – Question Bank

DISCRETE MATHEMATICS

[R204GA05401]

(Common to CSE, CSD & CSM)

CO	COURSE OUTCOMES	BL
CO1	Illustrate discrete mathematic components like statements, logic, sets, structures, numbers and combinatorics.	Understand
CO2	Evaluate and simplify propositional and predicate calculus using inference theory.	Apply
CO3	Perform the operations on Sets, Relations and functions and their properties.	Apply
CO4	Identify algebraic systems and use general properties on number theory.	Apply
CO5	Use combinatorics solving the counting problems.	Apply
CO6	Use graph algorithms for representing, identifying, generating and evaluating the Graphs.	Apply

****Note:** 1.Remeber(**R**), 2.Understand (**U**), 3. Apply (**A**) 4. Analyze (**An**), 5. Evaluate (**E**), 6. Create(**C**)*

UNIT – 1 (2 Marks)			
#	Questions	CO	BL
1	Construct the truth table ¬ (¬ P V ¬ Q).	CO1	Understand
2	What is Conjunction. Give an example.	CO1	Remember
3	Show that the formula Q V (P∧ ¬ Q) V (¬ P ∧ Q) is a tautology.	CO1	Remember
4	Define Disjunction. Give an example.	CO1	Remember
5	What is the negation of statement, “2 is even and -3 is negative”?	CO1	Remember
6	Define predicates.	CO1	Remember
7	Define tautology and contradiction.	CO1	Remember
8	Show that the propositions P → Q and ¬ P V Q are logically equivalent.	CO1	Remember
9	Construct the truth table for (P∧Q) V(Q ∧R) V (P∧¬R).	CO1	Understand
10	Define law of duality.	CO1	Remember

UNIT – 1 (5/10 Marks)				
#	Questions	M	CO	BL
1	Obtain the principal conjunctive normal form of the formula S given by (¬ P→R) ∧ (Q ↔ P).	5	CO2	Apply
2	Show that (R ∨S) follows logically from the premises (C∨D),(C ∨D) → ¬ H, ¬H →(A ⋀ ¬ B) and (A⋀¬ B) → (R∨S).	5	CO2	Apply
3	Construct the truth table for (Q ∨ (P → Q) → P).	5	CO2	Apply
4	Show that R ∨ (P∨ Q) is a valid conclusion from the premises P∨ Q, Q→R, P→M and ¬M.	5	CO2	Apply
5	Obtain the principal disjunctive normal form of (¬ P ∧ Q) and (P ∧ Q) V (¬ P ∧ R) V (Q ∧ R).	10	CO2	Apply
6	Show that S V R is tautologically implied by (P∨ Q) ⋀ (P →R) ⋀ (Q	5	CO2	Apply

UNIT – 1 (5/10 Marks)				
#	**Questions**	**M**	**CO**	**BL**
	→S).			
7	Explain the conjunctive normal form.	5	CO2	Understand
8	Explain the well - formed formulas with an example.	5	CO2	Apply
9	Explain disjunctive normal Form.	5	CO2	Understand
10	Explain the inference theory for predicate calculus.	10	CO2	Understand

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UNIT – 2 (2 Marks)			
#	**Questions**	**CO**	**BL**
1	Define the Power set. Give an example.	CO1	Remember
2	Define Inclusion and equality of sets.	CO1	Remember
3	What is relative complement and absolute complement.	CO1	Remember
4	Given A= { 2,5,6}, B={ 3,4,2}, C={ 1,3,4}, find A- B and B – A. Show that A – B ≠ B – A and A – C = A.	CO1	Understand
5	What is universal set and null set.	CO1	Remember
6	Define inverse function.	CO1	Remember
7	Define functions.	CO1	Remember
8	Define recursive function.	CO1	Remember
9	What is composition of function?	CO1	Remember
10	Define binary relation.	CO1	Remember

UNIT – 2 (5/10 Marks)				
#	**Quesions**	**M**	**CO**	**BL**
1	Explain transitive closure with an example.	5	CO3	Understand
2	Explain lattice and write its properties.	5	CO3	Understand
3	Explain the principle of inclusion and exclusion.	10	CO3	Understand
4	Explain relation matrix and digraph with an example.	10	CO3	Understand
5	What is relation? Explain the properties of binary relations with examples.	10	CO3	Understand
6	Let X = { 2, 3, 6,12,24,36} and the relation ≤ be such that x ≤ y if x divides y. Draw the Hasse diagram of (X, ≤) .	5	CO3	Understand
7	Let $f(x)= x^2- 3x + 2$, find $f(x^2)$, $f(y-x)$ and $f(x+3)$.	5	CO3	Remember
8	Show that functions $f(x)= x^3$, $g(x) =x^{1/3}$ for $x \in R$. Are inverse of each other.	5	CO3	Remember
9	Let f(x)= x+2, g(x)=x-2 and h(x) = 3x for $x \in R$ where R is set of real numbers.Find $g \circ f$; $f \circ g$; $f \circ f$; $g \circ g$; $f \circ h$; $h \circ g$; $h \circ f$ and $f \circ h \circ g$.	10	CO3	Remember
10	Demonstrate the relation a R b if a ≤ b in {1, 2, 3, 4} by using their matrix and Digraph.	5	CO3	Apply

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UNIT – 3 (2 Marks)			
#	**Questions**	**CO**	**BL**
1	What is an algebraic system?	CO 1	Remember
2	Define abelian group.	CO1	Remember
3	If (G, *) is a group and $a, b \in G$, then show that $(a * b)^{-1} = b^{-1} * a^{-1}$.	CO1	Understand

UNIT – 3 (2 Marks)			
#	Questions	CO	BL
4	If (G, *) is an abelian group, then for all a, b ∈ G, show that $(a*b)^n = a^n * b^n$.	CO1	Understand
5	What do you mean by group isomorphism? Give an example.	CO1	Remember
6	Define cyclic group.	CO1	Remember
7	Write the properties of integers.	CO1	Apply
8	Find the GCD of 826, 1890.	CO1	Apply
9	Define LCM. Give an example.	CO1	Apply
10	What is congruence relation. Give an example.	CO1	Apply

UNIT – 3 (5/10 Marks)				
#	Questions	M	CO	BL
1	Show that every cyclic group of order n is isomorphic to the group < Z_n, t_n>.	5	CO 4	Apply
2	Prove that a subset S ≠ Φ of G is a subgroup of < G, * >, if any pair of elements a, b ∈ S, $a * b^{-1} \in S$.	5	CO4	Apply
3	Explain Groups, Subgroups and Normal subgroups.	10	CO4	Understand
4	Let G1 and G2 be subgroups of a group G, show that G1∩G2 is also a subgroup of G and Is G1∪G2 is always a subgroup of G.	10	CO4	Understand
5	Explain about homomorphism.	5	CO4	Understand
6	Write the Euclidian algorithm with an example.	10	CO4	Understand
7	Explain the Fermat’s theorem and Euler’s theorem with an example.	10	CO4	Understand
8	Explain division theorem. Give an example.	10	CO4	Understand
9	Explain the testing for prime numbers with an example.	10	CO4	Understand
10	Define a semigroup and monoid. Give an example of a monoid which is not a group. Justify the answer.	5	CO4	Understand

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UNIT – 4 (2 Marks)			
#	Questions	CO	BL
1	Write the basic of counting principles.	CO1	Understand
2	In how many ways can the letters of the word 'READER' be arranged?	CO1	Remember
3	Define permutation. Give an example.	CO1	Apply
4	Define Directed Permutation.	CO1	Remember
5	Define combinations. Give an example.	CO1	Apply
6	How many ways can 12 white pawns and 12 black pawns be placed on the black squares of 8 X 8 chess board?	CO1	Remember
7	In how many ways can a hand of 5 cards be selected from a deck of 52 cards?	CO1	Remember
8	From a group of professors how many ways can a committee of 5 members be formed so that at least one of professor A and professor B will be included?	CO1	Understand
9	In how many ways can 12 of the 14 people be distributed into 3 teams where the firstteam has 3 members, the second has 5, and the third team has 4 members?	CO1	Remember
10	Suppose that Florida state university has a residence hall that has 5 single rooms, 5double rooms, and 3 rooms for 3 students each. In how many ways can 24 students be assigned to the 13 rooms.	CO1	Understand

UNIT – 4 (5/10 Marks)				
#	**Questions**	**M**	**CO**	**BL**
1	Explain the permutations and combinations with an example.	10	CO6	Apply
2	Explain generating Permutation Algorithm with an example.	5	CO6	Apply
3	Suppose that 200 faculty members can speak French and 50 can speak Russian, while only 20 can speak both French and Russian. How many faculty members can speak either French or Russian.	5	CO6	Understand
4	How many different outcomes are possible by tossing 10 similar coins?	5	CO6	Remember
5	Explain the circular permutations. Give an example.	10	CO6	Apply
6	Explain the enumerating permutations with constrained repetitions.	10	CO6	Understand
7	Explain the principles of inclusion – exclusion.	10	CO6	Understand
8	Explain pigeonhole principle and its applications.	10	CO6	Understand
9	Explain the multinomial theorem. Give an example.	10	CO6	Understand
10	State and prove binomial theorem.	10	CO6	Apply
11	Find out the coefficient of x^9y^3 in the expansion of $(x+2y)^{12}$ using binomial theorem.	5	CO6	Apply
12	Find out the coefficient of $a^2b^3c^2d^5$ in the expansion of $(a+2b-3c+2d+5)^{16}$using multinomial theorem.	5	CO6	Apply

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UNIT – 5 (2 Marks)			
#	**Questions**	**CO**	**BL**
1	Define graph coloring. Give an example.	CO5	Apply
2	Draw the graph of $K_{2,5}$.	CO5	Understand
3	Define multigraph. Give an example.	CO5	Apply
4	Mention the importance of graph coloring.	CO5	Understand
5	How many edges are there in a graph with 10 vertices each of degree 6?	CO5	Remember
6	Find a chromatic number of bipartite graphs?	CO5	Remember
7	Define planar graph. Give an example.	CO5	Apply
8	What is bipartite graph. Give an example.	CO5	Remember
9	What do you mean by graph isomorphism, show it by example?	CO5	Remember
10	Define spanning tree.	CO5	Remember

UNIT – 5 (5/10 Marks)				
#	**Questions**	**M**	**CO**	**BL**
1	Define K- regular graph. Give examples of 2- regular, 3- regular, 4- regulargraphs.	10	CO5	Apply
2	Prove that the complete graph of 5 vertices is non-planar.	5	CO5	Apply
3	Show that a connected graph ‘G’ with ‘n’ vertices has at least ‘n-1’ edges.	5	CO5	Understand
4	When it can be said that two graphs G1 and G2 are isomorphic?	5	CO5	Remember
5	Prove that a connected graph G is Euler if and only if all the vertices of G are even degree.	5	CO5	Apply
6	State and explain four color theorem with an example.	5	CO5	Apply
7	Explain krushkal’s algorithm with an example.	5	CO5	Apply

8	Differentiate between Eulerian graph & Hamiltonian graph with example. Andalso give an example of a graph which Eulerian but not Hamiltonian.	10	CO5	Apply
9	Write the algorithms for spanning trees with an example.	10	CO5	Apply
10	Explain the matrix representation of graphs with example.	10	CO5	Apply

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