SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

II B. Tech I Sem – Question Bank

DISCRETE MATHEMATICS

[R204GA05401]

(CSE)

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CO	COURSE OUTCOMES	BL
CO1	Understand the logical connectives, normal forms, predicates and verify the validity of an argument by the rules of inference.	Understand
CO2	Explain functions and its properties such as homomorphism and isomorphism.	Understand
CO3	Explain the general Properties of Semigroups, Monoids, Groups, and Lattices.	Understand
CO4	Illustrate the concepts like partially ordered relation (POSET), compatibility relation and Equivalence relations.	Apply
CO5	Find Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Apply Chromatic number of a graph and spanning trees in a graph.	Apply
CO6	Apply the concepts of permutations, combinations, principle of inclusion and exclusion, binomial and multinomial theorems to solve the counting problems.	Apply

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

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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	CO1	Understand
2	Show that (R ∨S) follows logically from the premises (C∨D), (C ∨D) → ¬ H, ¬H →(A ∧ ¬ B) and (A∧¬ B) → (R∨S).	5	CO1	Remember
3	Construct the truth table for (Q ∧ (P → Q) → P).	5	CO1	Understand
4	Show that R ∧(P∨Q) is a valid conclusion from the premises P∨Q, Q→R, P→M and ¬M.	5	CO1	Remember
5	Obtain the principal disjunctive normal form of (¬ P ∧Q) and (P ∧ Q) V (¬ P ∧ R) V (Q ∧ R).	10	CO1	Understand

6	Show that S V R is tautologically implied by (P∨Q) ∧ (P →R) ∧ (Q →S).	5	CO1	Remember
7	Explain the conjunctive normal form.	5	CO1	Understand
8	Explain the well - formed formulas with an example.	5	CO1	Understand
9	Explain disjunctive normal Form.	5	CO1	Understand
10	Explain the inference theory for predicate calculus.	10	CO1	Understand

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UNIT – 2 (2 Marks)			
#	**Questions**	**CO**	**BL**
1	Define the Power set. Give an example.	CO2	Remember
2	Define Inclusion and equality of sets.	CO2	Remember
3	What is relative complement and absolute complement.	CO2	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.	CO2	Remember
5	What is universal set and null set.	CO2	Remember
6	Define inverse function.	CO2	Remember
7	Define functions.	CO2	Remember
8	Define recursive function.	CO2	Remember
9	What is composition of function?	CO2	Remember
10	Define binary relation.	CO4	Remember

UNIT – 2 (5/10 Marks)				
#	**Questions**	**M**	**CO**	**BL**
1	Explain transitive closure with an example.	5	CO4	Understand
2	Explain lattice and write its properties.	5	CO3	Understand
3	Explain the principle of inclusion and exclusion.	10	CO2	Understand
4	Explain relation matrix and digraph with an example.	10	CO4	Understand
5	What is relation? Explain the properties of binary relations with examples.	10	CO4	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	CO4	Understand
7	Let f(x)= x^2- 3x + 2, find f(x^2), f(y-x) and f(x+3).	5	CO2	Remember
8	Show that functions f(x)= x^3, g(x) =$x^{1/3}$ for x ∈ R. Are inverse of each other.	5	CO2	Remember
9	Let f(x)= x+2, g(x)=x-2 and h(x) = 3x for x ∈ R where R is set of real numbers. Find g ∘ f; f ∘ g ; f ∘f; g ∘ g; f ∘ h; h ∘ g; h ∘ f and f ∘ h ∘ g.	10	CO2	Remember
10	Show that f(x, y) = x + y is primitive recursive.	5	CO2	Remember

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UNIT – 3 (2 Marks)			
#	**Questions**	**CO**	**BL**
1	What is an algebraic system?	CO3	Remember
2	Define abelian group.	CO3	Remember
3	If (G, *) is a group and a, b ∈ G, then show that $(a * b)^{-1} = b^{-1} * a^{-1}$.	CO3	Understand

4	If (G, *) is an abelian group, then for all a, b ∈ G, show that $(a*b)^n = a^n * b^n$.	CO3	Understand
5	What do you mean by group isomorphism? Give an example.	CO3	Remember
6	Define cyclic group.	CO3	Remember
7	Write the properties of integers.	CO6	Apply
8	Find the GCD of 826, 1890.	CO6	Apply
9	Define LCM. Give an example.	CO6	Apply
10	What is congruence relation. Give an example.	CO6	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	CO3	Understand
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	CO3	Understand
3	Explain Groups, Subgroups and Normal subgroups.	10	CO3	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	CO3	Understand
5	Explain about homomorphism.	5	CO2	Understand
6	Write the Euclidian algorithm with an example.	10	CO6	Apply
7	Explain the Fermat's theorem and Euler's theorem with an example.	10	CO6	Apply
8	Explain division theorem. Give an example.	10	CO6	Apply
9	Explain the testing for prime numbers with an example.	10	CO6	Apply
10	Define a semigroup and monoid. Give an example of a monoid which is not a group. Justify the answer.	5	CO3	Understand

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UNIT – 4 (2 Marks)			
#	**Questions**	**CO**	**BL**
1	Write the basic of counting principles.	CO6	Understand
2	In how many ways can the letters of the word 'READER' be arranged?	CO6	Remember
3	Define permutation. Give an example.	CO6	Apply
4	Find the generating function of the sequence $a_n = n, n \geq m$.	CO6	Remember
5	Define combinations. Give an example.	CO6	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?	CO6	Remember
7	In how many ways can a hand of 5 cards be selected from a deck of 52 cards?	CO6	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?	CO6	Understand
9	In how many ways can 12 of the 14 people be distributed into 3 teams where the first team has 3 members, the second has 5, and the third team has 4 members?	CO6	Remember
10	Suppose that Florida state university has a residence hall that has 5 single rooms, 5 double rooms, and 3 rooms for 3 students each. In how many ways can 24 students be assigned to the 13 rooms.	CO6	Understand

UNIT – 4 (5/10 Marks)				
#	**Questions**	**M**	**CO**	**BL**
1	Explain the permutations and combinations with an example.	10	CO6	Apply
2	Write about generating functions 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- regular graphs.	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. And also 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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