Time: 3 hours

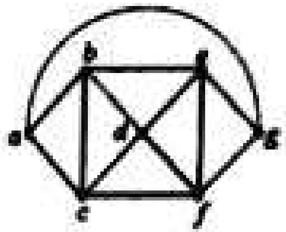
Note: Answer ALL Questions

Part-A (10 x 2 = 20 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
1. a)	Explain different logical connectives in mathematical logic	2	2	1	1,2,3
1. b)	Verify the following formulas are well formed formulas are not? (i) $P \rightarrow (P \vee Q)$ (ii) $(P \rightarrow (\sim P)) \rightarrow \sim P$ (iii) $((\sim Q \wedge P) \wedge Q)$	2	3	1	1,2,3,4
	Unit-II				
1. c)	If A= {1,2,3}, B= {4,5} find i) AXB ii) BXA	2	3	2	1,2,3
1. d)	Prove that $A-(B \cap C) = (A-B) \cup (A-C)$	2	3	2	1,3,4
	Unit-III				
1. e)	Differentiate between Mathematical Induction and Strong Induction	2	2	3	1,2,3
1. f)	Define Sum Rule and Product Rule.	2	1	3	1,3,4
	Unit-IV				
1. g)	Explain the principle of inclusion – exclusion?	2	2	4	1,2,3
1. h)	Solve the recurrence relation an= nan-1 for n≥1 where a0=1	2	3	4	1,3,4
	Unit-V				
1. i)	Define Spanning tree?	2	1	5	1,2,3
1. j)	Is K2,3 is a complete bipartite Graph?	2	2	5	1,3,4

Part-B (5 x 10=50 Marks)

Q. No.	Stem of the Question	M	L	CO	PO
	Unit-I				
2. a)	Show that $\sim p$ follows from the set of premises $(r \rightarrow \sim q)$, $r \vee s$, $s \rightarrow \sim q$, $p \rightarrow q$ using indirect method of proof	5	3	1	1,2,3
2. b)	Show that the following implication without constructing truth table (i) $(p \rightarrow q) \rightarrow q \Rightarrow (p \vee q)$ (ii) $p \rightarrow q \Rightarrow p \rightarrow p \wedge q$	5	3	1	1,2,3,4
	OR				
2. c)	a) Rephrase the statement formula $(P \rightarrow (Q \wedge R)) \wedge (\neg P \rightarrow (\neg Q \wedge \neg R))$ as principal conjunctive normal form. Also define PCNF and PDNF.	5	3	1	1,2,
2. d)	b) "If there was a ball game, then traveling was difficult. If they arrived on time, then traveling was not difficult. They arrived on time. Therefore, there was no ball game." Show that these statements constitute a valid argument.	5	2	1	1,2,3,4
	Unit-II				
3. a)	Find all the properties that satisfies for the following algebraic systems under the binary operations 'X' and '+'. (a) Odd integer (b) All positive integers	5	2	2	1,2,3
3. b)	Draw the Hasse diagram for X ={2,3,6,24,36,48- and relation ≤} be such that x≤y, if x divides y.	5	3	2	1,3,4
	OR				
3. c)	Prove that a relation R on A is symmetric if and only if $R = R^{-1}$	5	2	2	1,2,3
3. d)	A function f is defined as $f(x) = 2x - 3$ on a set R of real numbers. Check whether the function f is bijective or not, if so, find inverse of the function. And hence compute $f^{-1} o f$.	5	2	2	1,3,4
	Unit-III				
4. a)	Use mathematical induction to prove that **1 + 2 + 3 + ... + n = n (n + 1) / 2** for all positive integers n.	5	3	3	1,2,3
4. b)	Prove that $1^2 + 2^2 + 3^2 + ... + n^2 = n(n + 1)(2n + 1)/6$ using mathematical induction for all positive integers n.	5	3	3	1,3,4
	OR				
4. c)	State Pigeon hole principle. Make use of it, find how many people were born on the same month among 200 people.	5	2	3	1,2,3
4. d)	How many bit strings of length 8 contain i. exactly five 1's ii. an equal number of 0's and 1's iii. at least four 1's iv. at least three 1's and at least three 0's	5	3	3	1,3,4

Unit-IV					
5. a)	How many ways can we distribute 14 indistinguishable balls in 4 numbered boxes so that each box is non empty.	5	2	4	1,2,3
5. b)	A group of 8 scientists is composed of5-psychologists and 3-sociologists, in how many ways can a committee of 5 be formed that has 3- psychologists and 2-sociologists.	5	2	4	1,3,4
OR					
5. c)	Solve the recurrence relation $a_{n+2} + 3a_{n+1} + 2a_n = 3^n \ for\ n \geq 0,\ a_0 = 0, a_1 = 1$	5	2	4	1,2,3
5. d)	Solve the recurrence relation *an* − *an*−1 − 12*an*−2= 0, *a*0=0, *a*1 = 1.	5	2	4	1,3,4
Unit-V					
6. a)	Define chromatic number of the graph. Write the chromatic number of complete graph, cycle graph, wheel graph, bipartite graph and regular graph.	5	1	5	1,2,3,4
6. b)	Differentiate Hamiltonian and Eulerian graphs.	5	2	5	1,3,4
OR					
6. c)	Make use of BFS algorithm to find a spanning tree of the following graph. Also explain BFS algorithm. 	5	3	5	1,2,3
6. d)	State and prove fundamental theorem of graph theory.	5	1	5	1,3,4