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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, B.E. - Computer Science and Engineering

Semester End Examination; March - 2021

Discrete Mathematical Structures

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Verify the correctness of an argument using propositional and predicate logic.

CO2: Demonstrate the ability to solve problems using counting techniques and Combinatorics in the context of discrete probability.

CO3: Solve problems involving recurrence relations.

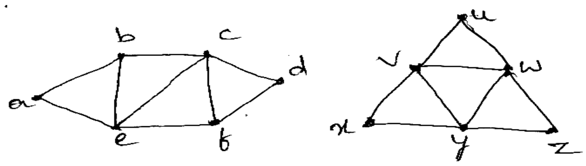
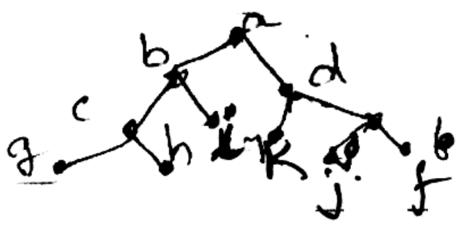
CO4: Construct proofs using direct proof, proof by contraposition, proof by contradiction, and proof by cases, and mathematical induction.

CO5: Ability to Explain and distinguish graphs and their properties.

Note: ***I) PART - A*** *is compulsory.* ***Two*** *marks for each question.*

II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for Maximum of* ***18 marks*** *from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I: PART - A	**10**			
I a.	Define principle of duality.	2	L1	CO1	
b.	Define Binomial coefficient.	2	L1	CO2	
c.	Define Partition set.	2	L1	CO3	
d.	Define Recursive definitions.	2	L1	CO4	
e.	Define complete graph.	2	L1	CO5	
	II: PART - B	**90**			
	UNIT - I	**18**			
1 a.	Define Logical equivalence. Show that, i) $P \wedge (\neg q \vee r)$ and $P \vee (q \wedge \neg r)$ are logically not equivalent ii) $P \vee [p \wedge (p \vee q)] \equiv p$	9	L3	CO1	
b.	Establish the validity of the argument; $p \rightarrow q$ $q \rightarrow (r \wedge s)$ $\neg r \vee (\neg t \vee u)$ $\underline{p \wedge t}$ $\therefore u$	9	L4	CO1	
c.	For the universe of all people, consider the open statements; $m(x): x$ is maths professor $c(x): x$ has studied calculus. Check the validity of the argument. All maths professors have studied calculus. Leona is a maths professor. $\therefore$ Leona has studied calculus.	9	L4	CO1	
	UNIT - II	**18**			
2 a.	If n is a positive integer, prove that; $1.2+2.3+3.4+.........+n(n+1)=\frac{n(n+1)(n+2)}{3}$ using mathematical induction.	9	L4	CO2	

b.	In how many ways eight men and eight women be seated in a row if, i) Any person may sit next to any other ii) Men and women occupy alternate seats	9	L4	CO2
c.	Find coefficient of, i) $x^2y^2z^3$ in the expansion of $(x+y+z)^7$ ii) $a^2b^3c^2d^5$ in expansion of $(a+2b-3c+2d+15)^{16}$	9	L4	CO2
	UNIT - III	**18**		
3 a.	Let *A = {a, b, c, d, e, f, g, h}* and *B ={1, 2, 3, 4, 5}*. How many elements are thee in $P(A \times B)$ and generalize the result.	9	L4	CO3
b.	Draw the Hasse diagram of all positive divisors of 36.	9	L4	CO3
c.	Let R be a relation as $(a,b) \in R$ iff *a* is multiple of *b* on *A* $\{1, 2, 3, 4\}$ i) Prove that R is an equivalence relation ii) Write relation matrix of R iii) Draw digraph of R iv) Find the partition induced by R on A	9	L4	CO3
	UNIT - IV	**18**		
4 a.	Determine the number of positive integers n where $1 \le n \le 100$ and n is not divisible by 2, 3, or 5.	9	L4	CO4
b.	i) List all the derangements of the numbers 1, 2, 3, 4, 5 where the first three numbers are 1, 2, 3 in some order ii) List all derangements of 1, 2, 3, 4, 5, 6 where first three numbers are 1, 2, 3 in some order	9	L4	CO4
c.	Solve the recurrence relation $2a_n = 7a_{n-1} - 3a_{n-2}$ with initial values $a_0 = 2$, $a_1 = 5$.	9	L4	CO4
	UNIT - V	**18**		
5 a.	Show that the given graphs are isomorphic.  (i) (ii)	9		CO5
b.	A classroom contains 25 microcomputers that must be connected to a wall socket that has four outlets. Connections are made by using extension cords that have four outlets each. What is the least number of cords needed to get these computers set up for class use?	9		CO5
c.	List the vertices in the tree given when they are visited in, i) Preorder traversal ii) Post order traversal iii) Inorder traversal 	9		CO5

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