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

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, Master of Computer Applications (MCA)

Semester End Examination; April / July - 2021

Mathematical Foundation for Computer Applications

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Explain the principles of counting and set theory.

CO2: Identify the quantifiers and their uses and Make use of fundamentals of logic theory.

CO3: Apply the mathematical induction principle and different methods to solve the given problems.

CO4: Solve the problems using the concepts of relations and functions and identify the different ways of representing relations.

CO5: make use of basic concepts of graph theory and solve the given problem.

***Note: I)** Answer any **FIVE** full questions, selecting **ONE** full question from each unit.*

***II)** Any **THREE** units will have internal choice and remaining **TWO** unit questions are compulsory.*

***III)** Each unit carries 20 marks.*

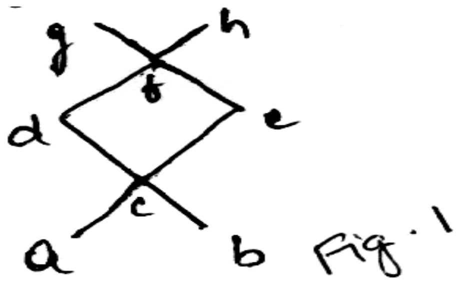
Q. No.	Questions	Marks	BLs	COs	POs
	UNIT - I				
1 a.	How many 6 characters license plates are created which consists of 2 alphabets followed by 4 digits such that, i) Without any restriction ii) Without repetition of a alphabets and digits	6	L1	CO1	PO2
b.	A certain question paper contains 2 parts A and B each containing 4 questions. How many different ways a student can answer 5 questions by selecting at least 2 questions from each part?	7	L1	CO1	PO2
c.	Find the number of permutations of the letter of the following words: i) PROGRESS ii) TOPOLOGY iii) ENGINEERING	7	L1	CO1	PO2
	OR				
1 d.	Prove that $\overline{(A\Delta B)} = A\Delta\overline{B} = \overline{A}\Delta B$ by membership method.	6	L5	CO1	PO1
e.	Find the number of integers between 1 to 200 that are, i) Divisible by either 2 or 5 or 9 ii) Not divisible by 2 or 5 or 9	7	L1	CO1	PO2
f.	A fair die is tossed twice, find the probability that; i) Even numbers occurs on both throws ii) An even number occur atleast one throw	7	L1	CO1	PO2
	UNIT - II				
2 a.	Define tautology. Prove that for any proposition p, q and r the compound proposition. $\left[(p \to q) \wedge (q \to r)\right] \to (p \to r)$ is a tautology using truth table.	6	L1	CO2	PO1

b.	Demonstrate symbolically and check validity of the given argument. If Ravi goes out with friends, he will not study If Ravi does not study, his father becomes angry His father is not angry Therefore Ravi has not gone out with friends	7	L2	CO2	PO2
c.	Outline a direct proof of the statement "the square of an odd integer is an odd integer".	7	L2	CO2	PO1
	UNIT - III				
3 a.	Prove by mathematical induction that for all positive integer $n \geq 1$, $1+2+3+4+---+n=\frac{1}{2}n(n+1)$..	6	L5	CO3	PO1
b.	Solve a recursive definition for the sequence, $i)\ a_n = 5_n\ for\ n \geq 2$ $ii)\ a_n = 3_n + 7\ for\ n \geq 2$	7	L3	CO3	PO2
c.	Define one-one functions, onto functions and find the number of one-one functions from a set of *m* elements to a set of *n* element.	7	L1	CO3	PO3
	OR				
3 d.	Define the following terms: i) Identity function ii) Constant function iii) Ceiling function iv) Floor function	8	L1	CO3	PO2
e.	State pigeon hole principle. Find the least number of ways of choosing three different numbers from 1 to 10 so that all choices have the same sum.	7	L1	CO3	PO2
f.	i) Let *A* and *B* be finite sets with $\lvert A\rvert = m\ and\ \lvert B\rvert = n$. Find how many functions are possible from *A* to *B*? ii) if there are 2187 functions from *A* to *B* and $\lvert B\rvert = 3, what\ is \lvert A\rvert = ?$	5	L1	CO3	PO2
	UNIT - IV				
4 a.	Let *A* = {1, 2, 3, 4, 6} and *R* be a relation on *A* defined by *aRb* iff *a* is multiple of *b* represent *R* as a set of ordered pairs. Design the diagraph and matrix representation of *R*.	6	L6	CO4	PO1
b.	Prove that the relation *R* = {(1, 1) (1, 2) (2, 1) (2, 2) (3, 4) (4, 3) (3, 3) (4, 4)}is an equivalence relation defined on the set *A* = {1, 2, 3, 4}. Also determine the partition induced.	7	L5	CO4	PO1
c.	If *A* = {1, 2, 3, 4} and *R* is a relation on set *A* defined by *R* = {(1, 2) (1, 3) (2, 4) (3, 2) (3, 3) (3, 4)} find R^2 and R^3 and also write there diagraph.	7	L1	CO4	PO2

Contd... 3

OR

4 d. Consider the Fig. 1 Hasse diagram of a Poset (A, R) given below, — 6 L1 CO4 PO2



If $B = \{c, d, e\}$ find;

i) All upper bounds of B

ii) All lower bounds of B

iii) The LUB of B

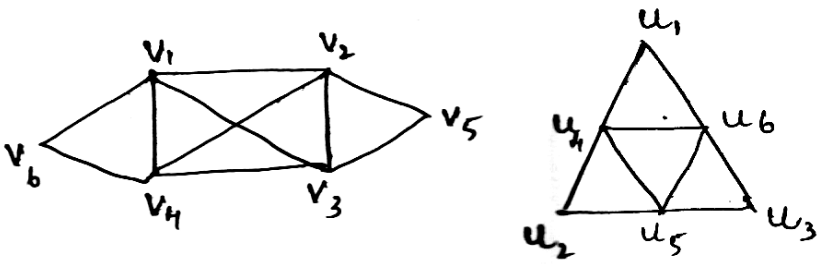
iv) The GLB of B

e. Define least element, greatest element, minimal element, maximal element of a relation R on A. — 7 L1 CO4 PO2

f. Define partially ordered set and draw the Hasse diagram of all positive divisors of 36. — 7 L1 CO4 PO1

UNIT - V

5 a. Define isomorphism. Verify the following graphs are isomorphic or not. Justify your answer. — 6 L1,5 CO5 PO1



b. Discuss on Konigsberg bridge problem related to origin of graph theory. — 7 L6 CO5 PO1

c. Define rooted tree, M-ary tree and balanced tree with an example for each. — 7 L1 CO5 PO2

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