U.S.N

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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; Dec. - 2019

Discrete Mathematics and Applications

Time: 3 hrs Max. Marks: 100

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
	I : PART - A	**10**
I a.	Rewrite the following statements without using the conditional [Hint: $(p\to q) \Leftrightarrow (\neg p \vee q)$] i) If I dream of home, then I will work hard and earn money ii) If I am awake, then I will on the computer or read a novel.	2
b.	State well ordering principle.	2
c.	Let A = {1, 2, 3}, B = {2, 4, 5}. Determine the following : i) $\lvert A\times B \rvert$ ii) Number of relations from A to B.	2
d.	State the principle of Inclusion and exclusion.	2
e.	Define Euler trials and circuits.	2
	II : PART - B	**90**
	UNIT - I	**18**
1 a.	Prove the following logical equivalence without using truth table: i) $\left[(p\vee q)\wedge(p\vee\neg q)\right]\vee q \Leftrightarrow p\vee q$ ii) $(p\to q)\wedge\left[\neg q\wedge(r\vee\neg q)\right]\Leftrightarrow\neg(q\vee p)$	9
b.	Prove the validity of the following arguments: i) $P\to r$ $\neg p\to q$ $\underline{q\to s}$ $\therefore \neg r\to s$ ii) $(\neg p\vee\neg q)\to(r\wedge s)$ $r\to t$ $\underline{\neg t}$ $\therefore p$	9
c.	i) Examine whether; $\left[(p\vee q)\to r\right]\leftrightarrow\left[\neg r\to\neg(p\vee q)\right]$ Is a tautology or not.	5
	ii) Find the possible truth values of *p, q, r, s, t* for which the following are contradictions? I) $\left[(p\wedge q)\wedge r\right]\to(s\vee t)$ II) $\left[p\wedge(q\wedge r)\right]\to(s\vee t)$	4

UNIT - II **18**

2 a. i) State pigeon hole principle. And ABC is equilateral triangle whole sides are of length 1cm each. If we select 5 points inside the triangle, Prove that at least two of these points are such that the distance between them is less than ½cm 5

ii) Let $f : R \rightarrow R$ be defined 4

$$f(0) = \begin{cases} 3x - 5 & for\ x > 0 \\ -3x + 1 & for\ x \leq 0 \end{cases}$$

I) Determine $f(0)$, $f\left(-5/3\right)$ II) Find $f^{-1}(1)$, $f^{-1}(-3)$

b. i) A = {1, 2, 3, 4, 5} and R is a relation on A defined by,

R = { (1, 2) (1, 3) (2, 4) (3, 2) (3, 3) (3, 4)} Find R^2 and R^3

ii) Let A = {1, 2, 3, 4) and B = {1, 2, 3, 4, 5, 6) 4

I) Find how many functions are there from A to B. How many these are one-to-one? How many are onto? 5

II) Find how many functions are these from B to A. How many these are one-to-one? How many are onto?

c. If R is a relation on the set A= {1, 2, 3, 4} defined by *xRy* if *x/y* (*x* divides *y*) Prove that (A, R) is a poset. Draw its Hasse diagram. 9

UNIT - III **18**

3 a. In the following cases, consider the partial order of divisibility on the set A. Draw the Hasse diagram for the poset and Determine whether the poset is totally ordered or not. 9

i) A = {1, 2, 3, 5, 6, 10, 15, 30} ii) B = {2, 4, 8, 16, 32}

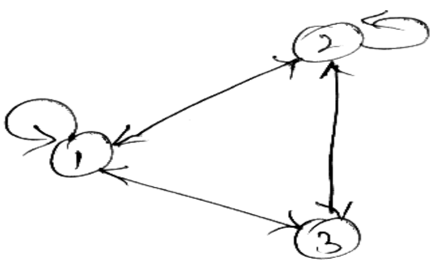
b. State and prove Lagrange's theorem. 9

c. i) Let A = {a, b, c, d, e}. Consider the partition P

P = { {a, b} {c, d} [{e}} of A. find the equivalence Relation including this partition.

ii) The diagraph of a relation R on the set A= {1, 2, 3} is as given below. Determine whether R is an equivalence relation or not. 5

4



UNIT - IV **18**

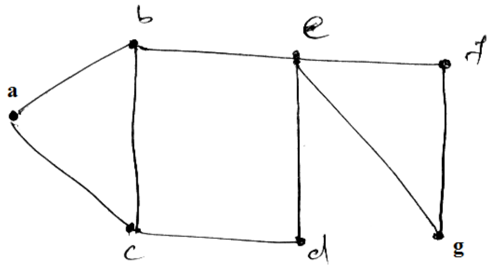
4 a. In the following figure, determine;

i) A walk from b to d that is not a trial ii) A b-d trial that is not a path

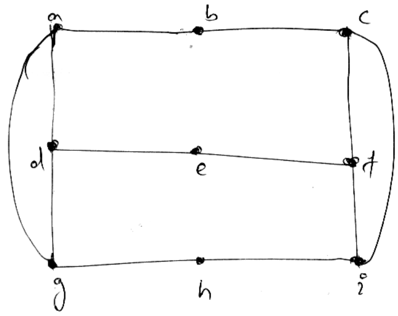
iii) A path from b to d iv) A closed walk from b to b that is not a circuit 9

v) A circuit from b to b that is not a cycle vi) A cycle from b to b

Contd…3



b. If G is the graph in the given below figure, the Edges {a, b}, {b, c}, {c, f}, {f, e}, {e, d}, {d, g}, {g, h}, {h, i} yield a Hamilton path for G. Does G have a Hamilton cycle 9



c. Draw all non isomorphic cycle free, connected graphs having six vertices. 9

UNIT - V **18**

5 a. i) Determine the number of positive integers n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5. 5

ii) In how many ways can the 26 letters of the alphabet; be permitted so that none of the patterns car, dog, pun or byte occurs. 4

b. Determine the generating function for the number of n-combinations of apples, bananas, oranges and pears wherein each n-combinations the number of apples in even, the number of bananas is odd, the number of oranges is between 0 and 4 and there is atleast one pear. 9

c. A person invests Rs. 1,00,000 at 12% interest compounded annually.

i) Find the amount at the end of 1st, 2nd, 3rd year

ii) Write the general explicit formula 9

iii) How many will it take to double the investment?

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