2021

Applied Mathematics with Oceanology and Computer Programming

[P.G.]

(CBCS)

(M.Sc. Third Semester End Examinations-2021)

MTM – 304

Full Marks: 50 ***Time: 02Hrs***

The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as far as practicable
Illustrate the answers wherever necessary

[DISCRETE MATHEMATICS]

1. Answer any FOUR questions. **2x4=8**

a) What is inclusion-exclusion principle ?

b) Prove that the number of odd degree vertices in a graph is even.

c) What is tautology ? Is $q \to (pvq)$ a tautology ?

d) Find the generating function of the sequence $\{1,-1,-1,1,-1,-1,1,-1,-1,1,.........\}$

e) In a Boolean algebra B, prove that x = y if $a+x = a+y$and $a' + x = a' + y$

f) What is cardinal number ? Find the cardinal number of , the set ofnatural numbers.

2. Answer any FOUR questions. 4x4=16

a) Describe the time completing of maximum among n number.

b) If $F_n$is the nth Fibonacei number, prove that

$$F_n = \frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n\right].$$, n being positive integer≥ 1

c) Prove that a simple graph with n vertices and K components can have at most $(n-k)(n-k+1)/2$ edges.

d) Express the DNF $F(x, y, z) = xyz + xy'z + xy'z'$ in CNF.

e) Let R be the relation on the set of people such that xRy if x and y are people and x is older than y Show that R is not a partial order relation.

f) Let S be the set of all positive integral divisors of 30. Define the binary operations (+), (.), (/) on s by

$a + b = \ell.c.m$ of $a \,\&\, b, \forall a, b \in S$

$a.b = ged$ of $a \,\&\, b, \forall a, b \in S$

And $a' = \dfrac{30}{a} \;\; \forall a \in S$

Prove that $(S, +, ., /)$ is a Boolean algebra.

3. Answer any TWO questions. 2x8=16

a) i) Using generating function, solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2}, \forall_n \geq 2$ with $a_0 = 6$ and $a_1 = 30$

ii) Prove that number of n vertices in a binary tree is always odd. 5+3

b) i) Show that the set of points in the closed interval [2, 4] and in the open interval (1, 2) are cardinally equivalent.

ii) Prove that the set Q is enumerable. 4+4

c) i) Among the 1st 500 positive integers, determine the integers which are neither divisible 5, 7, nor 9.

ii) Show that $(Z+, \leq)$ is a distributive lattice. 4+4

[Internal Marks – 10]