Total Pages-04 **RNLKWC/P.G.-CBCS/IIIS/MTM/303/21**

2021

Applied Mathematics with Oceanology and Computer Programming

[P.G.]

(CBCS)

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

MTM – 303

Paper MTM 303-1

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

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

UNIT-1

[DYNAMICAL OCEANOLOGY AND METEOROLOGY]

[MARKS – 25]

Answer any TWO questions. **2x2=4**

1. Define specific humidity in meteorological system
2. Define entropy for a perfect gas
3. Define salinity and concentration. Prove that $S+C_w=1$

Answer any TWO questions. **2x8=16**

4. a) Derive the hydrostatic equation in the atmosphere.

b) Write Poisson equation in terms of pressure and temperature.

c) Write down the basic physical laws used in oceanography

d) Write down the first law of thermodynamics.

2+2+2+1

5. a) Explain the terms "Coriolis force" and "thermohaline motion".

b) Derive the expression for a geopotential distance between two levels z_1 and z_2.

c) Combine the Coriolis terms acting on the horizontal plane with single term and then calculate its magnitude at different latitude $\varphi = 90^0, 45^0 30^0$ and 30^0 for current speed of 1 ms^{-1}. 2+2+4

6. a) Write the concentration of a solution quantitatively in four possible ways.

b) Write the equations of motion in oceanography.

c) Define potential temperature. Also derive hypsometric formula. 2+2+4

[Internal Marks – 05]

UNIT-2

Paper MTM 303-2

[OPERATIONS RESEARCH]

[MARKS – 25]

1. **Answer any TWO questions.** **2x2=4**

a) Define the term traffic intensity ρ. Explain when $\rho > 1$

b) State the necessary conditions for the multivariate optimization problem with equality constraint.

c) What are the importance of inventory control ?

2. **Answer any TWO questions.** **2x8=16**

a) The following date describe three inventory items. Determine the economic order quantity for each of the three items so that these items to be accommodated with in total available storage area of 651 sq. ft.

Item	Set-up Cost (Rs.)	Demand (unit per year)	Cost per unit (Rs.)	Storage area required per unit (sq. ft.)
1	100	2000	10	0.05
2	200	5000	20	0.60
3	75	10000	5	0.35

Where inventory carrying charge of 20% of average inventory valuation per year and shortages are not allowed.

b) Derive the difference equation for the $(M/M/1:\alpha/FCFS/\alpha)$ queuing system in steady state condition. Hence find the expression of P_n (probability of system having n customers).

c) Derive the Kuhn-Tucker conditions of the following Non-linear programing problem.

$$\textit{Maximize } f(x_1, x_2) = 2x_1 - x_1^2 + x_2 - 2x_2^2$$

$$\textit{Subject to} \quad 2x_1 + 3x_2 \le 6$$

$$2x_1 + x_2 \le 4$$

Hence solve it. State the sufficient condition of it.

[Internal Marks –05]