

**2021**

**Applied Mathematics with Oceanology and  
Computer Programming**

**[P.G.]**

**(CBCS)**

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

**MTM – 305A**

***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*

**[DYNAMICAL OCEANOLOGY]**

**Answer any five questions.**

**8x5=40**

1. Derive Gibb's thermo-dynamical relation for sea water.  
Prove that  $k_{\eta} + \Gamma \alpha = k_T$  (symbols have their usual meanings).
2. Derive the necessary conditions of thermodynamic equilibrium of a finite volume of sea water.
3. Drive the equation of continuity of motion of sea water.  
Discuss the Brunt-Váíśála frequency of the motion of sea water.

(2)

4. Establish the condition for the existence of internal boundary layer in a two dimensional model and show that accelerated boundary flow exist at the western shore of the ocean. 8

5. Derive the field equations approximately according to the Bossiness approximation. 8

6. Assuming the sea water to be a viscous compressible heat conducting fluid, derive the energy equation in the form

$$\frac{\partial}{\partial t}(\rho E_m) = -div \bar{I}_E,$$

Where symbols have their usual meanings. 8

7. Derive the Fridman's equation for vorticity in terms of motion relative to the earth. 8

[INTERNALASSESSMENT – 10]