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**Reg. No. : .....**

**Name : .....**

**Third Semester M.Sc. Degree Examination, June 2022**

**Physics with Specialization in Spacephysics**

**PHSP 534 : PHYSICS OF THE ATMOSPHERE**

**(2020 Admission)**

Time : 3 Hours Max. Marks : 75

PART – A

Answer any **five,** each carries **3** mark.

1. Write briefly about the chemical Composition of Atmosphere.
2. Explain the importance of study Carbon Cycle in the earth's atmosphere.
3. Explain the terms eddies and Laminar in the atmospheric boundary layer dynamics.
4. What is virtual temperature?
5. What is geopotential?
6. What is Green House effect and mention the green house gases?
7. Explain Beer's law.
8. Define the terms coupled climate variability and externally forced variability?

**(5 × 3 = 15 Marks)**

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## PART – B

Answer any **three** questions, each carries 15 marks.

9. (a) Describe the vertical structure of earth's atmosphere and explain the propeties of each layer? **6**

   (b) Write briefly about the Hydrology Cycle of Earth's and its importance in the various aspect of earth climate? **9**

OR

**10.** (a) What is virtual temperature and derive the relation connecting it with actual temperature and the pressure? **8**

   (b) Deduce the expression for geopotential heights in terms of virtual temperature. **7**

**11.** (a) Discuss the theory of radiative transfer in the planetory atmosphere and deduce the expressions for absorptivity and optical depth. **9**

   (b) Write the theory of Vertical Profiles of Radiative Heating in the Planetory atmospheres. **6**

OR

**12.** (a) Describe the theory of Dynamics of horizontal flow and discuss the various forces involved in the process. **6**

   (b) Explain the following wnds

   (i) Geostrophic Wind

   (ii) Gradient Wind

   (iii) Thermal Wind and deduce an expression for the velocity of the winds. **9**

13. (a) Deduce the primitive equations that governs the evolution of large-scale atmospheric motions and discuss its solution over atmospheric heating and climatic variations. **8**

   (b) Describe the theory of accoustic and Bouyancy waves in the atmosphere. **7**

OR

14. (a) Describe the theory of propagation of Rossby waves in three dimensional medium. **7**

   (b) Describe the theory of Remote sensing and explain the various satellite datas used for climate prediction. **8**

**(3 × 15 = 45 Marks)**



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## PART – C

Answer any **three** questions, each carries **5** marks.

15. A heavy tropical storm dumps 20 cm of rainfall in a region of the ocean in which the salinity is 35.00 g $kg^{-1}$ and the mixed layer depth is 50 m. Assuming that the water is well mixed, by how much does the salinity decrease?

16. Estimate how much the sea level would rise if the entire Greenland ice sheet were to melt. Given Surface area of earth and Land are $5.10 \times 10^{14}$ $m^2$ and $1.45 \times 10^{14}$ $m^2$ and the density of ice is $5 \times 10^3$ $kgm^{-2}$.

17. If air contains water vapor with a mixing ratio of 5.5 g $kg^{-1}$ and the total pressure is 1026.8 hPa, Calculate the vapor pressure $e$. Given the relative Molecular weight of water vapour $\varepsilon = 0.622$.

18. Calculate the virtual temperature for moist air at 30°C that has a mixing ratio of 20 g $kg^{-1}$, Given the relative Molecular weight water vapour with density $\varepsilon = 0.622$.

19. Estimate the relative efficiencies with which red light ($\lambda_r = 0.64\ \mu m$) and blue light ($\lambda_b = 0.47\ \mu m$ m) are scattered by air molecules.

20. Air at cloud base in a supercell updraft is observed to be in solid body rotation out to a radius of 2 km with a period of 15 minutes. Estimate the amplitude of the dynamically-induced radial pressure gradient. The density of the air at cloud base is 1 kg $m^{-3}$.

**(3 × 5 = 15 Marks)**

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