ST. SAINTS COLLEGE TRIVANDRUM

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R – 7603

Reg. No. : .....

Name : .....

Third Semester M.Sc. Degree Examination, July 2023

Physics with Specialization in Space Physics

PHSP 534 : PHYSICS OF THE ATMOSPHERE

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer **any five** questions. Each question carries **3** marks.

1. Discuss the coordinate system used in atmospheric studies.
2. State Dalton's law and its importance in atmosphere.
3. What is meant by geo-potential?
4. Discuss the term conditional instability?
5. What is the Greenhouse effect?
6. Discuss the term atmospheric general circulation.
7. Why parameterisation is used in atmospheric modelling?
8. What are the functions of an automatic weather station?

(5 × 3 = 15 Marks)

P.T.O.

SECTION – B

Answer **all** questions. Each question carries **15** marks.

9 (a) Discuss adiabatic lapse rate, and its variations in dry and moist cases. 9

(b) What is meant by boundary layer? Discuss its day-to-day and seasonal variations. 6

OR

10. (a) Derive the equation for hydrostatic equilibrium and discuss the vertical structure of atmospheric pressure with height. 6

(b) Distinguish between homogeneous and heterogeneous nucleation processes. 9

11. (a) Discuss the horizontal momentum equation and derive the condition for geostrophic motion. 9

(b) What is frictional geostrophic motion? 6

OR

12. (a) Discuss the main types of waves in atmosphere. 7

(b) Derive the dispersion relation for Rossby waves. 8

13. (a) What are the remote sensing methods adopted for atmospheric parameters? 7

(b) Discuss how satellites are used in atmospheric parameters sensing? 8

OR

14. (a) Discuss the problem of climatic variability. 8

(b) Distinguish between regional and global climate models. 7

(3 × **15 = 45 Marks**)

SECTION – C

Answer **any three** questions. **Each** question carries **5** marks.

15. Show that the thickness of a layer bounded by two isobaric surfaces is proportional to the mean temperature of that layer and the pressure difference across it.

16. Show that if the potential temperature increases with increasing altitude the atmosphere is stable with respect to the displacement of unsaturated air parcel.

17. How does the rotation of earth affect the vertical motion of air parcel?

18. Show that cloud droplet growing by condensation has initially increasing behaviour in radius very rapidly but their rate of growth diminishes with time.

19. Show that in the absence of scattering, the monochromatic absorptivity approaches unity exponentially with increasing optical depth.

20. Estimate the sensitivity of the Earth's equivalent blackbody temperature to a change in solar radiation incident upon the top of the atmosphere.

(3 × 5 = 15 Marks)
