

(This Question Paper contains 2 printed pages)

Roll No.:

- a) Sl. No. : 7448
b) Name of the Course : B.Sc. Hons.-(Physics)
c) Semester : VIII
d) Name of the Paper: :Atmospheric Physics and Climate Change (DSE)
e) Unique Paper Code: : 2223010034
f) Duration : 3 hours
g) Maximum Marks : 90

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Instructions for candidates

1. Write your Roll Number on the top immediately on receipt of this question paper
2. Attempt any five questions. Question 1 is compulsory. All questions carry equal marks.

Question 1. Attempt any six of the following

(3×6=18)

- a) Explain features of SAO in the stratospheric region.
- b) Why does the temperature increase in the stratospheric region?
- c) Explain how climate change affects the global hydrological cycle.
- d) What are the basic equations that govern large motion of Earth's atmosphere?
- e) What is the restoring force for atmospheric gravity waves? In which atmospheric layers are gravity waves commonly observed?
- f) Briefly explain the formation of sea breeze and land breeze.
- g) What is atmospheric radar? State the frequency range of VHF atmospheric radar. What is meant by radar backscattering in the atmosphere?

Question 2.

- a) Quasi-biennial oscillations plays a vital role in controlling large scale wind, show with a clear sketch in at least one parameter i.e. in wind or in temperature (6)
- b) Describe the routine radiosonde observational programme carried out by the India Meteorological Department (IMD). What atmospheric variables are recorded during these observations? -6
- c) Discuss the processes responsible for the development of convection in the tropical atmosphere during the summer season. Also explain how radar observations help in studying fine-scale atmospheric gravity wave systems. -6

Question:3

- a) Derive the general form of the radar range equation of a high-power radar (in VHF band) and explain the physical meaning of each term. What is the difference between mono-static and bistatic radar? 6
- b) Calculate range resolution for a 8 micro second pulse? What is the corresponding wavelength for a 47 MHz frequency radar? 6
- c) What is Doppler shift in radar systems, and how is it used to measure target velocity? 6

Question 4.

- a) Show a graphical representation of diurnal (24 hour) variation of pressure, relative humidity, temperature, and wind during winter with explanation. 6
- b) Give an account on different atmospheric wave system. 6
- c) Strong convection growth in the tropics is a common phenomenon, explain it- 6

Question 5.

- a) List the different sources of gaseous components for temperature rise? -6
- b) Give a description on the Net Zero Emissions to be achieved by India? -6
- c) What do you understand by aerosols, what is their role in the lower atmosphere? -6

Question 6. Write a short note on any of the three (6×3=18)

- i) Toxic air quality during winter in Delhi-NCR
- ii) Pollutants variability from summer to winter
- iii) Advantage of Radar observations in the atmosphere
- iv) Global rise in temperature and Climate change