

Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree Examination, December 2022

First Degree Programme under CBCSS

Physics

Core Course VI

**PY 1542 – STATISTICAL MECHANICS, RESEARCH METHODOLOGY AND  
DISASTER MANAGEMENT**

**(2018 Admission onwards)**

Time : 3 Hours

Max. Marks : 80

SECTION A

Answer **all** questions in a sentence or two, each carries **1** mark.

1. Define statistical probability.
2. Define bosons.
3. What is the meaning of research?
4. Explain the quantitative approach of research.
5. Define the term *sample* in research.
6. Define, error in the measurement of a physical quantity.
7. What are significant figures?
8. Name any three types of natural disasters.
9. What is a communicable disease?
10. What is an epidemic?

**(10 × 1 = 10 Marks)**

## SECTION B

Answer any **eight** questions, in a paragraph. Each question carries **2** marks.

11. Define a macro state.
12. Explain the concept of phases space.
13. What are Fermions?
14. What are the components of a good research thesis?
15. What is deliberate sampling?
16. What is systematic sampling?
17. Explain the scientific methods of research.
18. What is random error? How it can be estimated?
19. Distinguish between absolute error and relative error.
20. Briefly explain any four natural disasters.
21. Write a note on earths climatic variations.
22. With the help of an example, explain the spread of health disasters.
23. Write a note on the control of communicable deceases.
24. Explain the causes of Chernobyl accident.
25. Explain the methods to prevent sudden medical emergencies due to nuclear hazards.
26. Explain the measurement of the intensity of earthquakes.

**(8 × 2 = 16 Marks)**

## SECTION C

Answer any **six** questions. Each question carries **4** marks.

27. Calculate the fermi energy of an electron in metal whose fermi temperature is 50000 K.
28. A cubic meter of atomic hydrogen is at 273K contains  $2.7 \times 10^{25}$  atoms at atmospheric pressure. Calculate the number of atoms in its first excited state  $n = 2$ . Given that for atomic hydrogen degeneracy at  $n = 1$   $g(\epsilon_1) = 2$  and for  $n = 2$ ,  $g(\epsilon_2) = 8$  and  $\epsilon_1 = -13.6$  eV,  $\epsilon_2 = -3.4$  eV.
29. Calculate the rms speed of oxygen molecule at 273 K. Compare it with the speed of  $N_2$  gas at same temperature. Given that mass of an oxygen molecule is 32 amu and mass of  $N_2$  is 28 amu. 1 amu is  $1.66 \times 10^{-27}$  kg.
30. What are the criteria for good research?
31. Explain different methods of research.
32. What are the different motivations to undertake research?
33. The length of a rod measured in different persons are 2.51 m, 2.56 m, 2.49 m, 2.58 m, 2.48 m and 2.55 m respectively. Find the mean length, the absolute error, mean absolute error and the percentage error.
34. Explain different climatic regions of earth and the climatic conditions of that regions.
35. Explain seismic micro-zonation.
36. What are the methods of Tsunami forecasting?
37. Explain the significance protecting large scale water supply schemes.
38. Explain the medical diagnosis and therapy of nuclear radiations.

**(6 × 4 = 24 Marks)**

## SECTION D

Answer any **two** questions. Each question carries **15** marks.

39. Derive Maxwell-Boltzmann distribution function.
40. Explain the layout and essential parts of a research report or a thesis.
41. Write a detailed note on the process of research.
42. Explain the classification of errors and their causes.
43. Write a detailed note on the impact of Global climate change and natural disaster.
44. Name and explain the disasters caused and their management in recent years in India.

**(2 × 15 = 30 Marks)**

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