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Fifth Semester B.Sc. Degree Examination, February 2021

First Degree Programme under CBCSS

Physics

Core Course VI

PY 1542 : STATISTICAL MECHANICS, RESEARCH METHODOLOGY AND DISASTER MANAGEMENT

(2018 Admission - Regular)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Answer **all** the questions. Each carries **1** mark)

1. What are microstates?
2. Define Fermi free energy.
3. What are bosons?
4. What do you mean by research methods?
5. Write two criteria of good research.
6. What are different types of systematic errors?
7. How to determine the accuracy of the measurement?
8. What are natural disasters?

9. Write the importance of pre-disaster activity.

10. Give the number of significant figures in 0.00802.

(10 × 1 = 10 Marks)

SECTION – B

(Answer **any eight** questions. Each carries **2** marks)

11. Differentiate precision and accuracy.

12. Write the guidelines for rounding off the numerical values of various quantities.

13. Give the number of significant figures in following numbers.

    (a) 234.5 m

    (b) 400.005

    (c) 0.00687

    (d) 50 m

14. Briefly describe the research methodology.

15. What are the steps in disaster management?

16. Describe the objective of research.

17. What are the main characteristics of good research?

18. Write the layout of main text of thesis.

19. What are the graphical representation of error?

20. Explain μ space and Γ space.

21. Give the impact of global climate change.

22. Explain the design of preliminary section of thesis writing.

23. Explain microcanonical ensemble.

24. Give any four rules for determining significant figures.

25. Explain Gibb's paradox.

26. Define standard deviation. Write its formula.

(8 × 2 = 16 Marks)

SECTION – C

(Answer **any six** questions. Each carries **4** marks)

27. Explain various steps in research.

28. Calculate the Fermi energy of sodium assuming that the metal has one free electron per atom. Given h = 6.625×10^{-34} Js; mass of electron 9×10^{-31} kg; density of sodium = 970 kg/m^3; Avogadro's number = 6.02×10^{26} and atomic weight of sodium = 22.99.

29. Write a note on indistinguishability of identical particles.

30. The length of a rod measured in an experiment is recorded as 2.51 m, 2.56 m, 2.49 m, 2.58 m, 2.48 m, 2.55 m respectively. Find the mean length, absolute error, mean absolute error.

31. A student measures period of pendulum 5 times and the results are 2.9, 2.5. 2.7, 2.4 and 2.5 second. Find (a) Arithmetic Mean (b) Standard Deviation.

32. What all are the different types of research?

33. The length, breadth and thickness of a rectangular sheet of metal are 4.234 m, 1.005 m, and 2.01 cm respectively. Give the area and volume of the sheet to correct significant figures.

34. Write a note on recent major disaster and their relief efforts.

35. Give accounts personal hygiene and control of communicable disease.

36. The length ℓ, breadth b and thickness t of a block of wood were measured with the help of a measuring scale. The results with permissible errors are $\ell = 15.12 \pm 0.01$ cm, $t = 5.28 \pm 0.01$ cm. $b = 10.15 \pm 0.01$ cm. Calculate the percentage error in volume upto proper significant figures.

37. Compare three types of ensembles.

38. Explain the different ways of datá collection.

(6 × 4 = 24 Marks)

SECTION – D

(Answer **any two** questions. Each carries **15** marks)

39. Derive Fermi-Dirac distribution function.

40. Describe the importance of literature survey and criteria for good research.

41. Explain random and systematic errors with suitable examples. Write the importance of estimating errors.

42. What are earth quakes and their effects? Explain disaster preventions, mitigation and advancement in research area of earthquakes.

43. Explain disaster reduction activity along with achievements and challenges.

44. Derive the Maxwell-Boltzmann distribution law.

(2 × 15 = 30 Marks)

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