Ph.D Entrance Examination 2016

Model Question Paper

Time: 3 hrs

Max. Marks: 100

Part A

Answer any ten questions

All questions carry equal marks

1. What do you mean by research? Explain its significance in modern times.
2. How do you define a research problem? Give an example to illustrate your answer.
3. Describe some of the important research designs used in experimental hypothesis-testing research study.
4. Explain the meaning and significance of a Research design.
5. Write a comprehensive note on the Task of defining a research problem.
6. Explain the organization of a scientific paper.
7. Write the Ethics in scientific publishing.
8. What are the different factors to consider in choosing a journal?
9. How to prepare the title of a paper or a thesis?
10. Write the proper form of listing the authors and addresses in a paper.
11. Explain how to prepare the abstract of an article.
12. Give a brief account on writing the introduction of a paper or thesis.
13. Explain the method of citing the references.
14. Write a short note on tools and facilities available with Computer Technology.
15. Explain the use of Computer Technology in research report writing.

Part B

Answer any ten questions

All questions carry equal marks

1. Verify whether the following matrix is diagonalizable.

$$\begin{pmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 1 \\ 0 & 0 & 0 & 2 \end{pmatrix}$$

2. Let T: $R^2 \rightarrow R^3$ be defined by T (x, y) = (x - y, y, x + y). Find the matrix of T relative to the standard bases of R^2 and R^3.
3. Find the order of the element (4, 2) in the group $Z_{12} \times Z_8$.
4. Prove that no group of order 30 is simple.
5. Prove that the polynomial $8x^3 - 6x - 1 \in Q[x]$ is irreducible over Q[x].
6. Let X be the space of all real numbers with co-finite topology. Prove that X is compact.
7. Prove that continuous image of a connected space is connected.
8. In any metric space (S,*d*), show that every compact subset is complete.
9. Illustrate with an example for a sequence of differentiable functions $\{f_n\}$ with limit zero for which $\{f_n'\}$ diverges.
10. Show that if f is integrable over E, then so is |f| and $|\int_E f| \leq \int_E |f|$.
11. Prove that every tree has either exactly one center or two adjacent centers.
12. Find the value of $(1 + i)^n + (1 - i)^n$.
13. Show that a harmonic function u satisfies the formal differential equation $\frac{\partial^2 u}{\partial z \partial \bar{z}} = 0$.
14. Describe the mapping properties of $\omega = \frac{z}{1-z}$.
15. Prove that a bilinear mapping is continuous if it is continuous at the origin.

Professor and Head
Department of Mathematics
University of Kerala, Kariavattom
Thiruvananthapuram - 695 581