# The ICFAI University, Dehradun
# Ph.D. Entrance Examination, 2024
# IUDRET-2024
# Question Booklet

**MATHEMATICS**

**BOOKLET NO.:** 666769

**Signature and Name of Invigilators**

1. **(Signature):** _____ **OMR Sheet No.:** .....
   **(Name):** _____ (To be filled by the Candidate)
2. **(Signature):** _____ **Application No. :** .....
   **(Name):** _____ (To be filled by the Candidate)

**Time:** 2 Hours **Maximum Marks:** 50

**Number of Pages in this Booklet:** 07 **Number of Questions in this Booklet:** 50

**General Instructions: -**

1. Write the application number in the space provided.
2. This question booklet consists of fifty multiple-choice types of questions.
3. At the commencement of the examination, the question booklet will be given to you. In the first five minutes, you are required to open the question booklet and compulsorily examine it as below:
   (i) To have access to the question booklet, tear off the paper seal on the edge of this cover page. Do not accept a question booklet without a sticker seal and do not accept an open question booklet.
   (ii) Tally the number of pages and a number of questions in the booklet with the information printed on the cover page. A faulty question booklet due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be replaced immediately by a correct booklet from the invigilators within five minutes. Afterward, neither the question booklet will be replaced nor any extra time will be given.
   (iii) After this verification is over, the OMR Sheet Number should be entered into this question booklet.
4. Each item has four alternative responses marked (A), (B), (C), and (D). You have to darken the circle as indicated below on the correct response against each item.
   **Example:** Ⓐ Ⓑ ● Ⓓ where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet.** It will not be evaluated if you mark at any place other than in the circle in the OMR Sheet.
6. Rough Work is to be done in the space provided in the question booklet.
7. Before leaving the examination hall, candidate is required to return the question booklet and OMR sheet to the invigilators at the end of the examination compulsorily.
8. Use only Blue/Black Ball point pen.
9. Use of any calculator or log table etc., is prohibited.
10. There is no negative marking for incorrect answer.

## MATHEMATICS

**Note:** This question booklet contains **fifty (50)** objective-type questions, each carrying one (01) mark. Attempt all the questions.

1. Research is
   (A) A purposeful, systematic activity
   (B) Conducted for purely academic purposes
   (C) Conducted to answer questions about practical issues
   (D) A random, unplanned process of discovery

2. Qualitative research is
   (A) Without any specific purpose
   (B) Primarily concerned with in-depth exploration of phenomena
   (C) Deals with the collection and analysis of numerical data
   (D) Dependent upon spiritual aspects only

3. The quality of the research journal is indicated by its .....
   (A) h-index
   (B) g-index
   (C) Impact factor
   (D) i10-index

4. Research can be classified as
   (A) Basic, applied, and action research
   (B) Quantitative and qualitative research
   (C) Philosophical, historical, survey, and experimental research.
   (D) All the above

5. Which of the following can best be described as an ordinal variable?
   (A) Gender
   (B) Rank
   (C) Color
   (D) Religion

6. The correlation coefficient describes
   (A) Only magnitude
   (B) Both magnitude and direction
   (C) Only direction
   (D) None of the above

7. ..... plagiarism is allowed as per UGC Regulations, 2018
   (A) 10%
   (B) 20%
   (C) 40%
   (D) 25%

8. Arrange the following sections of a research report in correct sequence
   1. Abstract 2. Results
   3. Introduction 4. Methods
   (A) 1, 2, 3, 4
   (B) 1, 2, 4, 3
   (C) 4, 2, 1, 3
   (D) 1, 3, 4, 2

9. Match the following:

| List – I (Research Concept) | List – II (Characteristics) |
|---|---|
| a. Hypothesis | 1. It is statistical test that does not make assumptions about the parameters |
| b. Sample | 2. Device using which data are collected in research |
| c. Research tool | 3. A subset drawn from a larger set to represent it |
| d. Non parametric test | 4. A tentative statement indicating relationship between two or more variables |

Choose the correct answer from the options given below:

(A) a - 4, b - 3, c - 2, D – 1

(B) a - 1, b - 2, c - 3, d – 4

(C) a - 2, b - 1, c - 4, d – 3

(D) a - 3, b - 4, c - 1, 4 – 2

10. Which one of the following is not a type of hypothesis

(A) Null hypothesis

(B) Prediction hypothesis

(C) Alternative hypothesis

(D) Directional hypothesis

11. The process of selecting a subset of a population for a survey is known as

(A) Survey research

(B) Representation

(C) Triangulation

(D) Sampling

12. ICT stands for

(A) Information and communication technology

(B) Information-controlled technology

(C) Information-capable technology

(D) None of the above

13. A man's monthly income is 1400. What should be his average monthly expenditure so that he is able to save 3600 Rs. in a year?

(A) 1000

(B) 1100

(C) 1150

(D) 1200

14. If 'LIGHT' is coded as 'GILTH', then find the code for 'RAINY

(A) IARYN

(B) ARINY

(C) NAIRY

(D) RINAY

15. Scopus is a

(A) Full text database

(B) Numerical database

(C) Abstract and Citation database

(D) None of the Above

**Directions 16-20:** Study the following table carefully and answer questions 16–20. It consists of data on the graduates and postgraduates living in various towns.

| Towns | Graduates | Postgraduates |
|---|---|---|
| A | 10,200 | 8000 |
| B | 25,250 | 18,000 |
| C | 15,150 | 10,500 |
| D | 20,200 | 16,250 |
| E | 24,000 | 20,000 |
| F | 16,500 | 18,450 |

**16.** What is the difference between the number of graduates and the number of postgraduates in town C?

(A) 4500
(B) 4600
(C) 4650
(D) 4560

**17.** What is the average number of postgraduates in all the towns together?

(A) 15, 000
(B) 15, 500
(C) 16, 250
(D) 15, 200

**18.** What is the ratio of the number of graduates from towns A and B together to the number of postgraduates from towns A and E together?

(A) 709 : 580
(B) 709 : 560
(C) 560 : 709
(D) None of the above

**19.** What is the total number of graduates and postgraduates in towns A, D and F together?

(A) 85, 500
(B) 88, 600
(C) 89, 600
(D) 90, 600

**20.** The number of graduates in town F is approximately what percentage of the number of postgraduates in the same town?

(A) 84
(B) 89
(C) 92
(D) 95

**21.** The difference between total float and head event slack is

(A) Free float
(B) Independent float
(C) Linear float
(D) Interference float

**22.** Operations Research is very powerful tool for

(A) Research
(B) Operations
(C) Decision-making
(D) None of the above

**23.** When a linear program does not possess a finite optimum then solution is

(A) Unique optimum
(B) Unbounded
(C) Alternative optimum
(D) None of the above

24. When the kernel becomes infinite at one or more points within the range of integration then the integral equation is called

(A) Singular integral equation
(B) Abel's integral equation
(C) Linear integral equation
(D) None of the above

25. If the domain of integration is fixed then the integral equation is called

(A) Volterra integral equation
(B) Non-linear differential equation
(C) Fredholm integral equation
(D) None of the above

26. If d is the metric for non-empty set X, the ordered pair (X, d) is called

(A) Vector space
(B) Pseudo-metric
(C) Euclidean space
(D) Metric space

27. If $F_1$ and $F_2$ are the two closed subsets of a topological space X then $F_1 \cup F_2$ is a

(A) Closed set
(B) Open set
(C) Semi-closed set
(D) Semi-open set

28. In a metric space, every open sphere is an

(A) Closed set
(B) Semi open set
(C) Open set
(D) Semi closed set

29. The supremum of the set $S \subset R$, if it exists is following circumstances?

(A) Bounded above
(B) Unique
(C) Bounded below
(D) Variable

30. Every bounded sequence has at least

(A) Three limit points
(B) Two limit points
(C) One limit point
(D) None of the above

31. XOR gate stands for

(A) Exclusive OR
(B) NOR
(C) Exclusion
(D) None of the above

32. $p \leftrightarrow q$ is equal to

(A) $-q \rightarrow -p$
(B) $(p \rightarrow q) \wedge (q \rightarrow p)$
(C) $(p \rightarrow q) \vee (q \rightarrow p)$
(D) None of the above

33. The equivalent statement

$$p \vee (p \wedge q) = p$$

is called

(A) Law of Absorption
(B) Idempotent Law
(C) Involution Law
(D) Complement Law

34. In lattice, Sup {a,b} = a ∨ b is also called
(A) a and b
(B) a meet b
(C) a joint b
(D) a or b

35. The set of limit points of bounded sequence is
(A) Bounded
(B) Unbounded
(C) Either open or closed
(D) None of the above

36. When all the elements of the replacement ratio column are equal, the situation is known as
(A) Degeneracy
(B) Non-degeneracy
(C) Key position
(D) Tie

37. Primal of a Primal is
(A) Primal
(B) Dual
(C) Primal-dual
(D) None of these

38. A mixed strategy game can be solved by
(A) Graphical method
(B) Algebraic method
(C) Matrix method
(D) All of the above

39. The payoff value for which each player in a game always selects the same strategy is called
(A) Equilibrium point
(B) Saddle point
(C) Both (A) and (B)
(D) None of the above

40. To convert the transportation problem into a maximization problem we have to
(A) Multiply the rim requirements by −1
(B) Add the rim requirements by 1
(C) Subtract all the values from the maximum value of the matrix
(D) None of the above

41. A partial differential equation has
(A) One independent variable
(B) More than one dependent variable
(C) Two or more independent variable
(D) Equal number of independent and dependent variables

42. The partial differential equation
$$\frac{\partial^2 z}{\partial x^2} - 5\frac{\partial^2 z}{\partial y^2} = 0$$
is classified as
(A) Hyperbolic
(B) Parabolic
(C) Elliptic
(D) None of the above

43. $0^{th}$ rank tensor is called
(A) Vector
(B) Scalar
(C) Matrix
(D) None of the above

44. The vector which is denoted by superscript is called
(A) Mixed vector
(B) Covariant vector
(C) Contravariant vector
(D) Compound vector