



The ICFAI University, Dehradun
Ph.D. Entrance Examination, 2023
IUDRET-2023
Question Booklet

MATHEMATICS

148920

Signature and Name of Invigilator

1. (Signature) _____
(Name) _____
2. (Signature) _____
(Name) _____

OMR Sheet No.: _____
(To be filled by the Candidate)

Application No.

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(To be filled by the Candidate)

[Time: 2 Hours]

Number of Pages in this Booklet: 07

[Maximum Marks: 50]

Number of Questions in this Booklet: 50

General Instructions: -

1. Write your application number in the space provided at the top of this page.
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 5 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 5 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 Numbers 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: (A) (B) ● (D) 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. You have to return the question booklet and Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry them with you outside the Examination Hall. You are, however, allowed to carry a duplicate copy of the OMR Sheet at the conclusion of the examination.
8. Use only Blue/Black Ball point pen.
9. Use of any calculator or log table etc., is prohibited.
10. There are no negative marks for incorrect answers.



9. Match the following:

List – I (Research Type)	List – II (Characteristics)
a. Historical method	1. Past event
b. Survey method	2. Vision
c. Philosophical method	3. Present events
d. Experimental method	4. Future Action

Codes:

	a	b	c	d
(A)	1	3	2	4
(B)	1	2	3	4
(C)	1	4	2	3
(D)	2	1	4	3

10. Research hypotheses are

- (A) A review of current research
- (B) Statements of predicted relationships between variables.
- (C) Stated such that they can be confirmed or refuted
- (D) Both (b) and (c)

11. Which one is known as non-probability sampling?

- (A) Cluster sampling
- (B) Quota sampling
- (C) Systematic sampling
- (D) Stratified random sampling

12. The institution promoted by the Department of IT to provide communication infrastructure and services to academic research institutions in India is

- (A) INFLIBNET
- (B) UGC
- (C) ERNET
- (D) None of the above

13. Fill in the missing number in the following arrangement based on some principle

8	6	4
3	?	7
14	16	18

- (A) 4
- (B) 5
- (C) 6
- (D) 8

14. If 'EDUCATION' is coded as NOITACUDE, then 'RED FORT' will be coded as.

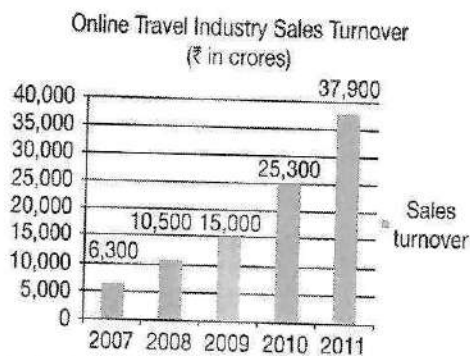
- (A) TROFDER
- (B) FORTRED
- (C) TROFRED
- (D) FORTDER

15. Which of the following type of histogram represents a normal distribution?

- (A) Bell-shaped
- (B) Cpmb
- (C) Skewed
- (D) Plateau



Directions: Study the bar graph given below and answer questions 16 to 20.



16. Which year witnessed the maximum growth in sales turnover in absolute terms?
 - (A) 2008
 - (B) 2009
 - (C) 2010
 - (D) 2011
17. Which year witnessed the maximum growth in sales turnover in percentage terms?
 - (A) 2008
 - (B) 2009
 - (C) 2010
 - (D) 2011
18. What is the average sales turnover during all the years (in crores)?
 - (A) 17000
 - (B) 18000
 - (C) 19000
 - (D) None of the above
19. What is the approximate percentage growth between 2007 and 2011?
 - (A) 400
 - (B) 500
 - (C) 525
 - (D) 600
20. How many years witnessed more than average growth?
 - (A) 1
 - (B) 2
 - (C) 3
 - (D) None of the above
21. Which of the following is not the phase of OR methodology?
 - (A) Formulating a problem
 - (B) Controlling the environment
 - (C) Constructing a model
 - (D) Establishing controls
22. In the graphical method the restriction on the number of constraints is
 - (A) 2
 - (B) Not more than 3
 - (C) 3
 - (D) None of the above
23. The solution to a transportation problem with 'm' rows (supplies) & 'n' column (destination) is feasible if number of positive allocations are
 - (A) $m+n$
 - (B) mn
 - (C) $m+n-1$
 - (D) $m-n$



24. An integral equation is said to be Volterra integral equation if upper limit of integration is
 (A) Variable
 (B) Constant
 (C) May be vary
 (D) may be constant
25. In integral equation, if a Kernel can be expressed as the sum of finite number of terms then called
 (A) Saparable kernel
 (B) Iterated Kernel
 (C) Resolvent Kernel
 (D) None
26. Every non empty set of real numbers which is bounded below has the
 (A) l.u.b. in \mathbb{R}
 (B) Infimum in \mathbb{R}
 (C) Rational number
 (D) Irrational number
27. Number of limit points of the null set ϕ is
 (A) 3
 (B) 2
 (C) 1
 (D) 0
28. The Union of two open sets is
 (A) Closed Set
 (B) Semi Open Set
 (C) Open Set
 (D) Semi Closed Set
29. An infinite set which is equipotent to the set of \mathbb{N} natural numbers is called
 (A) Denumerable Set
 (B) Countable Set
 (C) Infinite Set
 (D) Enumerable Set
30. A sequence $\langle x_n \rangle = \langle a, a, a, \dots \rangle$ for all $n \in \mathbb{N}$ is called
 (A) Bounded Sequence
 (B) Unbounded Sequence
 (C) Constant Sequence
 (D) Convergent
31. There are $(n+1)$ distinct atomic statements total possible combination of truth values are
 (A) 2^n
 (B) $n+1$
 (C) 8
 (D) 2^{n+1}
32. Inverse of $p \rightarrow q$ is equal to
 (A) $\neg q \rightarrow \neg p$
 (B) $\neg p \rightarrow \neg q$
 (C) $\neg p \leftrightarrow \neg q$
 (D) $\neg q \rightarrow p$



33. The intersection of two open sets is
 (A) Close
 (B) Semi Close
 (C) Open
 (D) Semi Open
34. Discrete Topology is
 (A) Finest topology
 (B) Coarsest topology
 (C) Extendable Topology
 (D) None
35. A topological space is said to be Door Space if every subset of X is
 (A) Closed
 (B) Open
 (C) Either Closed or Open
 (D) None
36. Basic feasible solution is a basic solution which also satisfies
 (A) Minimum condition
 (B) Maximum condition
 (C) Non (-)ve restrictions
 (D) None of these
37. In ordinary simplex method can use
 (A) Slack Variables
 (B) Surplus Variables
 (C) Artificial Variable
 (D) No Variable
38. When one or both the limits of integration become infinite then integral equation is known as
 (A) Homogeneous
 (B) Normal
 (C) Singular
 (D) Symmetrical
39. A linear integral equation of the form $u(x) = \lambda \int_a^b k(x, t)u(t)dt$ is called
 (A) Homog. Fredholm I kind
 (B) Volterra Ist kind
 (C) Volterra IInd kind
 (D) Homog. Fredholm II kind
40. An equation in which an unknown function appears under one or more integral signs is
 (A) Homogeneous equation
 (B) PDE
 (C) Integral equation
 (D) None of these
41. The saddle point of the payoff matrix is
 (A) Value of an element
 (B) Point itself
 (C) Mode of Element
 (D) Position of an Element
42. The dual of the dual of given primal problem is
 (A) Dual
 (B) Special dual
 (C) Primal
 (D) None



43. A game is said to be zero sum game if
- (A) $\sum_{i=1}^n v \neq 0$
 - (B) $\sum_{i=1}^n v = 0$
 - (C) $\sum_{i=1}^n v \neq 1$
 - (D) $\sum_{i=1}^n v = 1$
44. $P \vee P = P$ is called
- (A) Law of Absorption
 - (B) Idempotent Law
 - (C) Involution Law
 - (D) Complement Law
45. $p \vee q = q \vee p$ represents the law
- (A) Distributive Law
 - (B) Identity Law
 - (C) Commutative Law
 - (D) Associative Law
46. In conditional statement $(p \rightarrow q)$ is false only when
- (A) p and q both are true
 - (B) p and q both are false
 - (C) q is true and p is false
 - (D) q is false and p is true
47. The Shortest curve joining two fixed point is called
- (A) Curved Line
 - (B) Straight line
 - (C) Path
 - (D) None of these
48. Euler's equation independent of y is
- (A) $\frac{\partial f}{\partial y'} = \text{constant}$
 - (B) $\frac{\partial f}{\partial y} = \text{constant}$
 - (C) $\frac{\partial f}{\partial x} = \text{constant}$
 - (D) None of these
49. Metric space X is bounded if its diameter is
- (A) Infinite
 - (B) Finite
 - (C) One
 - (D) None of these
50. Ext (A) is the largest open set contained in
- (A) A
 - (B) Complement of A
 - (C) Subset of A
 - (D) Superset of A

