Topology of Metric Spaces MCQ

Sixth Semester B.Sc.Mathematics Elective Course

School of Distance Education
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1. A set with same algebraic structure is called

   (a) Set (b) Space (c) Properset (d) Topology

2. Let (X, τ) be a topological space and let $A, B \subseteq X$. Then what will be ϕ^o and X^o respectively.

   (a) X and ϕ (b) ϕ and X (c) X and X (d) ϕ and ϕ

3. Topology is derived from two greek words topos and logos, where the meaning of topos is –

   (a) Study (b) Geometry (c) Surface (d) None of these

4. If A and B are two subsets of a topological space, (X, τ) and they are disjoint. Then what will be $A \cap B$?

   (a) ϕ (b) $A \cup B$ (c) X (d) None of these

5. In a topological space (X, τ), the members of τ are called

   (a) Open sets (b) Closed sets

   (c) Topology members (d) None of the above

6. Let (X, τ) be a topological space and $A \subset X$ then exterior of A is

   (a) $X - A$ (b) $(X - A)^c$ (c) $(X - A)^o$ (d) X

7. In a topological space (X, τ), the subclasses ϕ and X are

   (a) always open (b) always closed (c) connected (d) None of these

8. Let (R, τ) be a usual topological space and $A, B \subseteq R$, where $A = (2, 3)$ and $B = (4, 5)$ then

   (a) $A$and B are seperated (b) A and B may be seperated

   (c) A and B are seperated (d) None of these

9. What will be the value of $\bar{A}$ in terms of boundary of A, $b(A)$?

   (a) $\bar{A} = A \cap b(A)$ (b) $\bar{A} = A \cup b(A)$ (c) $\bar{A} = A - b(A)$ (d) None

10. A is open if and only if $A \cap b(A)$=—?

    (a) ϕ (b) ϕ^c (c) X (d) A

11. A is closed if and only if (in terms of $b(A)$)

    (a) $b(A) \subseteq A^c$ (b) $b(A) \supseteq A^c$ (c) $b(A) \subseteq A$ (d) $b(A) \supseteq A$

12. A is open if and only if $A \cap b(A)$=—?

    (a) ϕ (b) ϕ^c (c) X (d) A

13. What is the relation between $\bar{A}$, $\bar{B}$ and $\overline{A \cap B}$

(a) $\overline{A \cap B} = \bar{A} \cap \bar{B}$ (b) $\overline{A \cap B} = \bar{A} \cup \bar{B}$

(c) $A \cap B \neq \bar{A} \cup \bar{B}$ (d) None of the above

14. Let X be a non-empty set and $\mathbb{R}$ be set of real numbers then $d : X \times X \to \mathbb{R}$ is called

(a) Metric (b) Metric Space (c) Connected set (d) Closed

15. If a topological space admits no nontrivial partition into open sets, then it s called.

(a) Connected (b) Bounded (c) Separable (d) Closed

16. The diameter of a subset A of a metric space (X, d) is

(a) Sup$\{d(x, y)/(x, y) \in A\}$ (b) Inf$\{d(x, y)/(x, y) \in A\}$

(c) Max$\{d(x, y)/(x, y) \in A\}$ (d) None of the above

17. An oriented surface, and it can be embedded without self-intersection into $\mathbb{R}^3$.

(a) $Kleinbottle$ (b) $Torus$ (c) $Fractal$ (d) Knot

18. A discrete topological space with at least 2 points is

(a) Connected (b) Bounded (c) Compact (d) Closed

19. A Hausdorff space which is totally disconnected.

(a) Discrete topological space (b) Indiscrete topological space

(c) finite set (d) None of the above

20. Every sequence of points has a convergent subsequence in.

(a) Real metric space (b) Compact metric space

(c) Discrete topological space (d) None of the above

21. Let X be any infinite topological space and τ be the family consisting of ϕ and complement of finite subset of X. Then tau is called

(a) Co-finite topology (b) Co-complement topology

(c) No solution (d) None of the above

22. The set $C[a, b]$ of all real continuous functions defined on $[a, b]$ is a subset of the set of all real valued $----$ defined on $[a, b]$

(a) Bounded functions (b) Closed functions

(c) Unbounded functions (d) separable functions

23. Let X be any set and $\tau = X, \phi$. Then τ is called

(a) Co-finite topology (b) Co-complement topology

(c) Indiscrete topology (d) None of the above

24. If $X = a, b, c$, then how many topologies are possdible from set X.

(a) 9 (b) 29 (c) 27 (d) 31 —

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25. In a discrete space (X, d), every subset is

(a) Open ball (b) Bounded set (c) Open set (d) Closed ball

26. Let (X, τ) be a usual topological space, where $X = \{a, b, c\}$. Then which of the following is not a topology on X.

(a) $\tau_1 = \{\phi, X\}$ (b) $\tau_2 = \{\phi, X, a\}$

(c) $\tau_3 = \{\phi, X, \{a\}, \{a, b\}\}$ (d) $\tau_4 = \{\phi, X, \{a\}, \{a, b\}, \{b, c\}\}$

27. Let $\tau = \{B, P(R); B\}$ is interval in form $[0, b)$. Then τ is called

(a) Co-finite topology (b) Co-complement topology

(c) Indiscrete topology (d) Lowerlimit topology

28. On a set X, which is weakest topology

(a) Co-finite topology (b) Co-complement topology

(c) Discrete topology (d) Indiscrete topology

29. Let (X, τ) be s topological space, where $X = \{a, b, c\}$. Then which of the following is a topology on X.

(a) $\tau_1 = \{\phi, X\}$ (b) $\tau_2 = \{\phi, X, a\}$

(c) $\tau_3 = \{\phi, X, \{a\}, \{a, b\}\}$ (d) All of these

30. Let $X = \{a, b, c\}$ and $\tau = \{\phi, X, \{a\}, \{b\}, \{a, b\}\}$ be a topology on X. Then which of the following is not closed in X.

(a) $\{b, c\}$ (b) c (c) $\{a, c\}$ (d) All of these

31. Let (X, τ) be a topological space. Then which of the following is a base for topology τ

(a) $B = \{\{x\}; x \in X\}$ (b) $\{X\}$

(c) $\{X, \phi\}$ (d) None

32. In a topological space (X, τ) if every open cover has a countable subcover, then (X, τ) is called

(a) Separable space (b) Countable space (c) Lindelof space (d) Category

33. In a topological space (X, τ) having A is a dense set and B is dense in A, then B is

(a) Interior set (b) Open set (c) Closed set (d) Dense set

34. In a topological space (X, τ) having D as dense set and C is any set containing dense set, then C, is

(a) Interior set (b) Open set (c) Compact set (d) Dense set

35. In an indiscrete space, what will be the neighborhood of everypoint

(a) X (b) B (c) ϕ (d) None

36. Let τ and ϕ are two topologies on set X. If $\tau \subset \phi$, then

(a) τ is finer than ϕ (b) τ is coarser than ϕ

(c) ϕ is coarser than τ (d) $m \neq n$

37. Every finite point set in a Hausdorff space S is

(a) Closed (b) Open (c) Hausdorff (d) Connected

38. If X is a Hausdorff space, then a sequence of points of X

(a) Converges to most one point of X (b) Converges to at least one point of X

(c) Diverges to most one point of X (d) Diverges to at least one point of X

39. The ordered square is connected but not

(a) Path (b) Interval (c) Path connected (d) Hausdorff

40. A finite Cartesian product of a connected space is

(a) Closed (b) Separated (c) Hausdorff (d) Connected

41. For a singleton set $A \subseteq \mathbb{R}$ in real line $(\mathbb{R}, d)$, and the interior of A denoted by A^0, we have

(a) $A^0 = A$ (b) $A^0 = \phi$ (c) $\phi^0 = \phi$ (d) None of these

42. Which of the following is not a topological property

(a) Openness (b) Closeness (c) Connectedness (d) Boundedness

43. Let X be the real line, Y be the set of integers and $A = 1$ then closure of A in Y is

(a) X (b) Y (c) A (d) None of these

44. Let X be the real line with co-finite topology and $A = (0, 1)$, then which of the following is not a limit point of A

(a) 0 (b) 1

(c) 2 (d) None of the above

45. If (X, τ) is a topological space and $B \subset \tau$ is a basis then the sets $U \in B$ are called the

(a) Basic closed sets (b) Closed sets (c) Basic open sets (d) None of these

46. For $n \geq 1$, $\mathbb{R}$ is

(a) T_1 space (b) T_2 space (c) Hausdorff (d) None of these

47. If (X, τ) is Hausdorff and X is finite. Then τ is the

(a) Discrete topology (b) Co-finite topology

(c) Finite topology (d) All of these

48. Let X be a finite topological space. Then X is

(a) Closed (b) Separated (c) Compact (d) Connected

49. Which of the following is a compact set?

(a) $(0, 1)$ (b) $[0, 1]$ (c) $(1, 1)$ (d) $(0, 0)$

50. The space $[0, 1]^{\omega}$ with the product topology is

(a) Bounded (b) Unbounded (c) Finite (d) Metrizable

51. The set $\mathbb{N}$ of natural numbers equipped with the discrete topology is

(a) Bounded (b) Unbounded (c) Metrizable (d) None of these

52. A subspace of R is connected if and only if it is

(a) Compact (b) Pathconnected (c) Connected (d) Closed

53. A topological space X is connected if and only if every discrete valued map on X is

(a) Closed (b) Constant (c) Open (d) Connected

54. An infinite set in the finite complement topology is always

(a) Closed (b) Compact (c) Open (d) Connected

55. How many topologies can be made on a 1-point set

(a) Exactly one (b) Zero (c) Two (d) Three

56. Let X be a compact topological space, Y Hausdorff, $f : X \to Y$ a continuous bijection. Then f is

(a) Isomorphism (b) Metrizable (c) Open (d) homemorphism

57. Consider indiscrete space, that is a nonempty set X with $\tau = \{\phi, X\}$. then the basis for τ is $\beta =$

(a) $\{X\}$ (b) $\{X^c\}$ (c) ϕ (d) None

58. Which one is the smallest possible topology on a set

(a) Indiscrete topology (b) Discrete topology

(c) Proper set (d) None of these

59. Every element of τ can be written as a union of elements of β if β is

(a) Basis τ in X (b) Boundary of X (c) Closure of X (d) Interior of X

60. Which of the following is a basis for a topology on R.

(a) $(a, b) \subseteq \mathbb{R} : a, b \in \mathbb{R}$ (b) $(0, 1)$

(c) $[a, b] \subseteq \mathbb{R} : a, b \in \mathbb{R}$ (d) None

ANSWER KEY

Question No	Answer	Question No	Answer	Question No	Answer
1	b	21	b	41	b
2	b	22	a	42	d
3	c	23	c	43	c
4	a	24	b	44	d
5	a	25	c	45	c
6	c	26	d	46	c
7	a	27	d	47	a
8	a	28	d	48	c
9	b	29	d	49	b
10	a	30	d	50	d
11	c	31	a	51	c
12	a	32	c	52	b
13	c	33	d	53	b
14	a	34	d	54	d
15	a	35	a	55	a
16	a	36	b	56	d
17	b	37	a	57	a
18	a	38	a	58	a
19	a	39	c	59	a
20	c	40	d	60	a

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