Q.N	TYBSc(Mathematics) Subject:-MTH-501:Metric Spaces Question Bank	Ans.
1.	In Discrete Metric space (X, d), $d(x, y) = 0$, if … a. $x = y$ b. $x < y$ c. $x > y$ d. $x \neq y$	**A**
2.	The Set A is countable if A is … a. Finite b. Denumerable c. either finite or denumerable d. None of These	**C**
3.	If a set A is equivalent to the set of natural numbers, then A is … set. a. Denumerable b. Infinite c. Uncountable d. None of These.	**A**
4.	The set $\mathbb{Z}$ of integers is a. Finite b. Denumerable c. Not Denumerable d. None of These	**B**
5.	A proper subset of Countable set is … a. Uncountable b. Countable c. Infinite d. None of These	**B**
6.	The set $\mathbb{Q} \times \mathbb{Q}$ is a. Finite b. Denumerable c. Not denumerable d. None of These	**B**
7.	If $\rho: M \times M \to [0, \infty)$ is pseudo metric in M then which of the following is a false statement? a. $\rho(x, y) = \rho(y, x), \quad \forall x, y \in M$ b. $\rho(x, y) \geq 0, \quad \forall x, y \in M$ c. $\rho(x, y) = 0 \Rightarrow x = y, \quad \forall x, y \in M$ d. $\rho(x, y) \leq \rho(x, z) + \rho(z, y), \quad \forall x, y, z \in M$	**C**
8.	If $d: M \times M \to [0, \infty)$ defined as $d(A, B) = \lvert \det A - \det B \rvert, \ \forall A, B \in M \ where\ M$ is set of all $n \times n$ matrices over reals then … a. d is a metric on M b. d is pseudo metric on M c. Both a and b d. None of These	**B**
9.	If $f: A \to B$ is one-one function and $f(a) = f(b)$ then … a. $a \neq b$ b. $a > b$ c. $a < b$ d. $a = b$	**D**

10.	A set A is said equivalent to a set B if $f: A \to B$ is … a. One-one b. Onto c. Both a and b d. None of These	**C**
11.	If a Cauchy sequence has a convergent subsequence then it is …. a. divergent b. convergent c. Both convergent and divergent d. Not convergent	**B**
12.	Any ……subset in a metric space is bounded. a. infinite b. finite c. finite and infinite both d. None of these	**B**
13.	In a metric space (M, ρ), an open sphere of radius r about a, $S(a, r) = \cdots$ a. $\{x \in M : \rho(x, a) \leq r\}$ b. $\{x \in M : \rho(x, a) \neq r\}$ c. $\{x \in M : \rho(x, a) > r\}$ d. $\{x \in M : \rho(x, a) < r\}$	**D**
14.	In a metric space (M, ρ), an closed sphere of radius r about a, $S[a, r] = \cdots$ a. $\{x \in M : \rho(x, a) \leq r\}$ b. $\{x \in M : \rho(x, a) \neq r\}$ c. $\{x \in M : \rho(x, a) > r\}$ d. $\{x \in M : \rho(x, a) < r\}$	**A**
15.	The open sphere $S(x_0, r)$ for usual metric is … a. (x_0, r) b. $(x_0 - r, x_0 + r)$ c. $[x_0 - r, x_0 + r]$ d. $[x_0, r]$	**B**
16.	Let (M, ρ) be a metric space and $a \in M$ them the set $\{x \in : \rho(x, a) \leq r\}$ is called a. Open Set b. Closed Set c. Closed Sphere d. Open Sphere	**C**
17.	If A is an open set in a metric space, (M, ρ), then A^C is … in (M, ρ) a. Closed Set b. Open Set c. Both a and b d. None of these	**A**
18.	In Interval $[a, b]$ in the usual metric space is … a. Open set b. Closed Set c. Half open Set d. Hale Closed Set	**B**
19.	If A and B are open subset of $\mathbb{R}$, then $A \times B$ is … a. Open in $\mathbb{R}^2$ b. Open in $\mathbb{R}$ c. Closed in $\mathbb{R}$ d. Closed in $\mathbb{R}^2$	**A**
20.	The characteristic function χ_G is … at each point of G. Where G is open set in $\mathbb{R}$. a. Continuous b. Discontinuous c. Not continuous	**A**

	d. None of these	
21.	If f and g are continuous real valued functions on the metric space X. Then the set $A = \{x \in X : f(x) < g(x)\}$ is … a. Closed b. Half-open c. Open d. Half-closed	**C**
22.	If $a \in \mathbb{R}$ then $[a, \infty)$ is a subset of $\mathbb{R}$. a. Open b. Closed c. Half-open d. Half Closed	**B**
23.	A function $f: X_1 \to X_2$ is called as isometry if a. $d_1(x,y) \neq d_2\big(f(x),\ f(y)\big) \quad \forall x, y \in X_1$ b. $d_1(x,y) = d_2\big(f(x),\ f(y)\big) \quad \forall x, y \in X_1$ c. $d_1(x,y) < d_2\big(f(x),\ f(y)\big) \quad \forall x, y \in X_1$ d. $d_1(x,y) > d_2\big(f(x),\ f(y)\big) \quad \forall x, y \in X_1$	**B**
24.	A subset A of X is said to be dense in X if $\bar{A} = \ldots$ a. A b. A^C c. $\bar{X}$ d. X	**D**
25.	A mapping $T: X \to X$ is a contradiction on X it there exists a real number α, independent of $x, y \in X$ with $0 \le \alpha < 1$. a. $d(Tx, Ty) \le \alpha d(x,y)$ b. $d(Tx, Ty) > \alpha d(x,y)$ c. $d(Tx, Ty) = \alpha d(x,y)$ d. $d(Tx, Ty) < \alpha d(x,y)$	**A**
26.	If $T: X \to X$ is defined as $Tx = x^2$, where $X = \left[0, \frac{1}{3}\right]$ then T is … a. Not Continuous on $\left[0, \frac{1}{3}\right]$ b. A contraction on $\left[0, \frac{1}{3}\right]$ c. Continuous $\left[0, \frac{1}{3}\right]$ d. Both b and c	**D**
27.	If A is totally bounded subset of a metric space, (M, ρ) then $\bar{A}$ is a. Not totally bounded b. Totally bounded c. Not bounded d. None of These	**B**
28.	If A is an infinite set in a discrete metric space, then X ……with respect to discrete metric space. a. Bounded and totally bounded b. Bounded but not totally bounded c. Unbounded and totally bounded d. None of these	**B**
29.	The metric space $[0, 1]$ with absolute value metric space is … a. Not bounded b. Totally bounded c. Complete d. Both b and c	**D**
30.	If the metric space (M, ρ) is both totally bounded and complete, then it is … a. Connected	**C**

	b. Discrete c. Compact d. Not Compact	
31.	The continuous image of a compact metric space is … a. Not compact b. Compact c. Disconnected d. None of these	**B**
32.	The function $f: (0, 1) \to \mathbb{R}$ defined by $f(x) = \frac{1}{x}$ is a. Both continuous and Uniformly continuous b. Uniformly continuous but not continuous c. Continuous but not Uniformly continuous d. Neither continuous nor Uniformly continuous	**C**
33.	If A_1 and A_2 are connected subsets of a metric space X then $A_1 \cup A_2$ is also connected if … a. $A_1 \cap A_2 = \phi$ b. $A_1 \cap A_2 \neq \phi$ c. $A_1 \cap A_2 = X$ d. None of These	**B**
34.	The series $A = \{x \in \mathbb{R} : x > 0\}$ and $B = \{x \in \mathbb{R} : x < 0\}$ are … set. a. Connected b. Separated c. Not connected d. None of These	**B**
35.	If A and B are subset of M and $A \subset B$ then a. $\bar{A} = \bar{B}$ b. $\bar{A} \supset \bar{B}$ c. $\bar{A} \subset \bar{B}$ d. None of These	**C**
36.	If A and B are subset of M then choose correct a. $\overline{A \cap B} \subset \bar{A} \cap \bar{B}$ b. $\overline{A \cap B} \supset \bar{A} \cap \bar{B}$ c. $\overline{A \cap B} = \bar{A} \cap \bar{B}$ d. None of These	**A**
37.	In any metric space every … subset of $\mathbb{R}$ is totally bounded. a. Bounded below b. Bounded above c. Bounded d. Unbounded	**C**
38.	On … metric space every continuous function is uniformly continuous. a. Not Complete b. Not Compact c. Compact d. Not totally bounded	**C**
39.	If B is a countable subset of an uncountable set A then $(A - B)$ is … a. Countable b. Uncountable c. Denumerable d. None of These	**B**
40.	Which of the following set is not compact? a. The set of real number b. Set of integers c. (0, 1) d. All of the above	**D**

41.	Which of the following is a countable set? a. Set of real numbers b. Set of rational numbers c. Set of irrational numbers d. None of these	**B**
42.	In Metric space (M, ρ), $\rho(x, y) \ldots \rho(x, z) + \rho(z, y), \quad \forall x, y \in M$ a. > b. = c. < d. ≠	**C**
43.	If $A_1, A_2, \ldots \ldots, A_n$ are denumerable sets, then $\bigcup_{n=1}^{\infty} A_n$ is … a. Finite Set b. Non-Countable set c. Non-Denumerable d. Denumerable	**D**
44.	In Discrete metric space $(X, d), d(x, y) = 1$, if a. $x < y$ b. $x > y$ c. $x \neq y$ d. $x = y$	**C**
45.	The Set $\mathbb{N} \times \mathbb{N}$ is … a. Finite b. Denumerable c. Non-Denumerable d. None of These	**B**
46.	In a metric space (M, ρ), $\rho(x, y) = 0$ if and only if … a. $x = y$ b. $x \neq y$ c. $x < y$ d. $x > y$	**A**
47.	If A is denumerable set, then A is equivalent to the set of … a. Integers b. Natural Numbers c. Real Numbers d. Rational Numbers	**B**
48.	If (X, d) is a metric space and $d_1(x, y) = \frac{d(x,y)}{1+d(x,y)}$, $\forall x, y \in X$. Then (X, d_1) is … metric space a. Unbounded b. Discrete c. Bounded d. Pseudo	**C**
49.	A metric space $(\mathbb{R}, \rho)$ where $\rho(x, y) = \|x - y\|$, $\forall x, y \in \mathbb{R}$ is called as a. Discrete metric space b. Usual Metric Space c. Pseudo metric space d. All of These	**B**
50.	The subset $[0, 1]$ of $\mathbb{R}$ is … a. Countable b. Finite c. Uncountable d. Denumerable	**C**
51.	Let (M, ρ) be a metric space, then finite union of closed sets in (M, ρ) is … a. Open set	B

	b. Closed set c. Half-closed set d. Half-open set	
52.	A metric $d: \mathbb{R} \times \mathbb{R} \to [0, \infty)$ defined as $d(x, y) = \|x^2 - y^2\|,\ \forall x, y \in \mathbb{R}\ is$ ... on ℝ. a. Metric b. Pseudo Metric c. Not Countable d. None of These	**B**
53.	If A and B are two countable sets, then $A \times B$ is … a. Uncountable b. Countable c. Not Countable d. None of These	**B**
54.	Let (M, ρ) be a metric space and $x_0 \in M$. The set $\{x \in M : \rho(x, x_0) < r\}$ is called … a. Open Set b. Closed Set c. Closed Sphere d. Open Sphere	**D**
55.	If A is a closed set in a metric space, (M, ρ), then $(M - A)$ is … a. Closed Set b. Open Set c. Both a and b d. Half-closed set	**B**
56.	A set $\{x\}$ in the usual metric space $(\mathbb{R}, \rho)$ is … a. Half-open b. Closed c. Half-closed d. Open Set	**B**
57.	(a, b) in the usual metric space is a. Open set b. Closed set c. Semi-open set d. None of These	**B**
58.	If A and B are closed subsets of ℝ, then $A \times B$ is … a. Open in $\mathbb{R}^2$ b. Open in ℝ c. Closed in $\mathbb{R}^2$ d. Closed in ℝ	**C**