## QUESTION BANK FOR SEMESTER V ATKT TYBSC MATHS PAPER III (TOPOLOGY OF METRIC SPACE)

	Choose correct alternative in each of the following				
1	Let $(X,    /  / )$ be a normed linear space and $x, y, z \in X$ if d is metric induced by the norm then				
	(a) $d(x+z,y+z) \ge d(x,y)$	(b)	$d(x+z,y+z) \ge d(x,y) + d(y,z)$		
	(c) $d(x+z, y+z) = d(x, y)$	(d)	None of these.		
2	The usual distance on $R$ is given as follow	/S.			
	(a) $d(x,y) =  x-y $		d(x,y) =   x-y		
	(c)  d(x,y) =  x - 2y	\ /	None of these.		
3	Let $(X,    / )$ be a normed linear space and :				
	(a) $  x-y   \le   x   -   y  $		x-y   =    x   -   y		
	(c) $  x-y   \ge   x   -   y  $	(d)	None of these.		
4	Let $(X, d)$ be a metric space and $x, y, z \in X$ .				
	(a) $d(x,y) \le d(x,z) + d(z,y)$		$d(x,y) \ge d(x,z) + d(z,y)$		
	(c) $d(x,y) = d(x,z) + d(z,y)$	\ /	d(x,y) > d(x,z) + d(z,y)		
5	Let $(X, d)$ be a metric space then which of th	e follow	ving is an induced metric.		
	(a) $d_1(x,y) = \sqrt{d(x,y)}$	(b)	$d_1(x,y) = d^2(x,y)$		
	(c) $d_1(x,y) = max\{1, d(x,y)\}$	(d)	None of these.		
6	Let $(X, d)$ be a metric space and $x, y \in X$ . Let $d(x, y) = s > 0$ . Then $B(x, r) \cap B(y, r) = \emptyset$ if				
	(a) $r \ge \frac{s}{2}$	(b)	$0 < r \le \frac{s}{2}$		
	(c) <i>r</i> ≥2 <i>s</i>	(d)	None of these.		
7	Let $(X, d)$ be a discrete metric space and $x \in X$ . Then which of the following open ball is not a				
	singleton set.				
	(a) $B(x, \frac{1}{2})$		$B(x,\frac{3}{4})$		
	(c) $B(x, 1)$		B(x,r), r > 1		
8	Let $(X, d)$ be a metric space in which the only		<del>-</del>		
	(a) d is discrete metric on $X$ .	` ′	$d(x,y) \ge 1$ , if $x \ne y$ .		
	(c) X is a singleton set.	(d)	None of these.		
9	The set $U = \{(x, y) \in \mathbb{R}^2 / x^2 - y^2 \le 1\}$ with Euclidean metric is				
	(a) An Open set in $\mathbb{R}^2$ .	(b)	A Closed set in $\mathbb{R}^2$ .		
	(c) Both Open and closed set in $\mathbb{R}^2$ .	(d)	None of these.		
10	A rectangle of the form $(a, b) \times (c, d)$ is an	open se	et in		
	(a) $R^2$ with Euclidean metric.	(b)	$R^2$ with $///_2$ norm.		
	(c) $R^2$ with discrete metric.	(d)	All of the above.		
11	The set of rational numbers $Q$ is				

	( )	I	(1.)				
	(a)	An open set in R with usual metric.	(b)	A closed set in R with usual metric.			
	(c)	Neither open nor closed in <i>R</i> with usual metric.	(d)	None of these.			
12	In a	In a metric space $(X, d)$					
	(a)	An arbitrary intersection of open set is an open set.	(b)	An arbitrary intersection of open ball is an open ball.			
	(c)	An intersection of finitely many open balls is an open ball.	(d)	None of these.			
13	The	set $U = R \setminus Z$ , subset of R with usual	metric	, is			
	(a)	An open set in $R$ .	(b)	A closed set in R.			
	(c)	Neither open nor closed in R.	(d)	None of these.			
14	Let	$(X, d)$ be a metric space and $x \in X$ , $0 < r$	T. 2 >	hen			
	(a)	$B(x,r) \subseteq B(x,s)$ and equality may occure.	(b)	$B(x,r) \subset B(x,s)$			
	(c)	$B(x,r) = B(x,s) \text{ if } r \ge 1.$	(d)	None of these.			
15	Con	sider the metric space $(N, d)$ and $(N, d)$	) whe	ere $d$ is usual distance in $R$ and $d_1$ is the			
	discr	rete metric in $N$ .Then					
	(a)	The two metric spaces do not have same open balls.	(b)	The open balls in two metric spaces are same.			
	(c)	Every open ball in $(N, d)$ is an open ball in $(N, d_1)$ .	(d)	None of these.			
16		According to Housdorff property for any two distinct points $x, y \in X$ there exists $r > 0$ such that					
	(a)	$B(x,r) \cup B(y,r) = \emptyset$	(b)	$B(x,r) \cap B(y,r) \neq \emptyset$			
	(c)	$B(x,r) \cup B(y,r) \neq \emptyset$	(d)	$B(x,r)\cap B(y,r)=\varnothing$			
17	Let	$\overline{A}$ be any finite set in a metric space ( $X$	(d)				
	(a)	An open set.	(b)	A closed set.			
	(c)	Open as well as closed.	(d)	None of these.			
18	Let $(X, d)$ be a metric space and $d_1$ be the metric on $X$ defined by $d_1(x, y) = \frac{d(x, y)}{1 + d(x, y)}$ then						
	(a)	$d$ and $d_1$ are equivalent metrics on $X$	(b)	$d$ and $d_1$ are not equivalent metrics on $X$ .			
	(c)	Every open ball in $(X, d)$ is an open ball in $(X, d_1)$ .	(d)	None of these.			
19	Evei	Every closed ball in a metric space $(X, d)$ is					
	(a)	A closed set.	(b)	An open set.			
	(c)	Both open and closed.	(d)	None of these.			
20	Very	y open ball in a metric space $(X, d)$ is					

(a)	A closed set.	(b)	An open set.
(c)	Both open and closed.	(d)	None of these.

(a) $K$ is compact. (b) $K$ is compact if $K$ is closed. (c) $K$ is compact if $K$ is bounded. (d) $K$ is compact if $K$ is finite. (22) Which of the following subsets of $R^3$ is compact? (a) $\{(x,y,z) \in R^3 : x^2 + y^2 - z^2 = 1\}$ (b) $\{(x,y,z) \in R^3 : x^2 - y^2 - z^2 = 1\}$ (c) $\{(x,y,z) \in R^3 : x^2 + y^2 + z^2 = 1\}$ (d) None of these. (a) $[0,1] \cup [2,3]$ is compact. (b) $[0,1] \cup [2,3]$ is compact. (c) $[0,1] \cup \{x \in \mathbb{N} : x \geq 3\}$ is compact. (d) $[0,1] \cup [2,3]$ is compact. (e) $[0,1] \cup \{x \in \mathbb{N} : x \geq 3\}$ is compact. (d) $[0,1] \cup [2,3]$ is compact. (e) $[0,1] \cup \{x \in \mathbb{N} : x \geq 3\}$ is compact. (d) $[0,1] \cup [2,3]$ is compact. (e) $[0,1] \cup \{x \in \mathbb{N} : x \geq 3\}$ is compact. (e) $[0,1] \cup [2,3]$ is a compact subset of $[0,1] \cup [2,3]$ is a compact subset of a metric space is compact. (e) $[0,1] \cup [2,3]$ is a compact subset of a metric space is compact. (e) $[0,1] \cup [2,3]$ is a compact subset of $[0$						
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28 The set $\{n + \frac{1}{n} : n \in N\}$ in $(R, d)$ , $d$ is usual distance, is		` ′	-	` '		
"		` '	7	` ′		
1 12 1 2	28		,,	ıl distar		
		(a)	Compact	(b)	Not compact.	
(c) Connected. (d) None of these.		` ′		( )		
The set $\{(x,y) \in \mathbb{R}^2 :  x  +  y  \le 1\}$ as a subset of $(\mathbb{R}^2, d)$ , d being Euclidean distance, is	29	The set $\{(x,y) \in \mathbb{R}^2 :  x  +  y  \le 1\}$ as a subset of $(\mathbb{R}^2, d)$ , d being Euclidean distance, is				

	(a)	Compact	(b)	Not compact.
	(c)	Not Connected.	(d)	None of these.
30	If $A$	and B are disjoint non-empty subsets	of a m	netric space $(X, d)$ such that $A$ is closed and
	B is	compact then		
	(a)	d(A,B)=0	(b)	d(A,B) < 0
	(c)	d(A,B) = 1	(d)	d(A,B) > 0

31	Let $(X,d)$ be a metric space. A Sequence $\{x_n\}$ in X is said to converge to $x \in X$ if for expression $\{x_n\}$ in X is said to converge to $\{x_n\}$ in X is said to $\{x_n\}$ in X is said to converge to $\{x_n\}$ i			$X$ is said to converge to $X \in X$ if for every	
	€ > (	$\epsilon > 0$ , there exists $n_0 \epsilon N$ such that			
	(a)	$d(x_n, x) < \epsilon$ for all $n \ge n_0$	(b)	$d(x_n, x) \le \epsilon$ for all $n \ge n_0$	
	(c)	$d(x_n, x) = \epsilon$ for all $n \ge n_0$	(d)	$d(x_n, x) \ge \epsilon$ for all $n \ge n_0$	
32	Let	(X,d) be a metric space. A Sequence {x	<sub>n</sub> } in Σ	$X$ is converge to $x \in X$ if and only if the	
	sequ	$in ence (d(x_n, x))$			
	(a)	converges to 0 in R	(b)	converges to 0 in X	
	(c)	diverges to 0 in R	(d)	converges and diverges to 0 in R	
33	If X	is normed linear space then $(x_n)$ is bound	nded it		
	(a)	$  \mathbf{x}_{\mathbf{n}}   \leq \mathbf{M}$ for all $\mathbf{n} \in \mathbf{N}$	(b)	$  x_n   \le M \text{ for all } n \in N$	
	(c)	$  \mathbf{x}_{\mathbf{n}}   = \mathbf{M}$ for all $\mathbf{n} \in \mathbf{N}$	(d)	$  x_n   \ge M \text{ for all } n \in N$	
34	Eve	ry convergent sequence in a metric space	e is		
	(a)	bounded	(b)	closed	
	(c)	Cauchy	(d)	closed and bounded	
35 Every Cauchy Sequence in a metric space is					
	(a)	bounded		closed	
		bounded	(b)	Closed	
	(c)	convergent	(d)	convergent and bounded	
36	Let $(X,d)$ be a metric space and A be a subset of X. p $\epsilon$ closure of A if and only if there exists				
	a sec	quence of points of A			
	(a)	converging to p	(b)	converging to 0	
	(c)	converging to p and 0 both	(d)	does not converge to p	
37	A no	on empty set A is said to be countable if	there	exists	
	(a)	a injective function $f: A \rightarrow N$	(b)	a surjective function $f: A \rightarrow N$	
	(c)	a bijective function $f: A \rightarrow N$	(d)	a injective and surjective both function	
			(u)	$f: A \rightarrow N$	
38	A m	etric space (X,d) is said to be separable	if X	has a	
	(a)	countable dense subset	(b)	convergent sequence	
	(c)	uncountable dense subset	(d)	dense subset of X	
39	If A	and B are dense subsets of a metric spa	ce (X,	, d) and one of A, B is open then	

	_	1					
	(a)	A∩ B is dense in X	(b)	A∪ B is dense in X			
	(c)	A + B is dense in X	(d)	A * B is dense in X			
40	A metric space (X,d) is said to be complete		if eve	ry			
	(a)	Cauchy sequence in X converges to	(b)	a bounded sequence in X converges to a			
	(a)	a point in X.	(0)	point in X.			
	(c)	Closed and bounded sequence in X	(d)	subsequence in X converges to a point in			
	(0)	converges to a point in X.	(u)	X.			
41	Evei	ry finite metric space is					
	(a)	complete	(b)	bounded			
	(c)	closed	(d)	complete and closed			
42	A C	omplete subspace of a metric space is					
	(a)	closed	(b)	bounded			
	(c)	closed and bounded	(d)	compact			
43	Bolz	zano Weierstrass Theorem states that					
	(a)	every bounded real sequence has a	(b)	every bounded real sequence has not a			
	(a)	convergent subsequence	(0)	convergent subsequence			
	(c)	every bounded real sequence has a	(d)	every bounded real sequence and Cauchy			
		Cauchy sequence		sequence has a convergent subsequence			
Let $f:[a,b] \rightarrow R$ be a continuous real valued function. Suppose $f(a)$ a							
	sign	gn, then there exists $p \in [a,b]$ such that $f(p) = 0$ . This statement is					
	(a)	Intermediate Value Theorem	(b)	Cauchy theorem			
	(c)	Cantor's theorem	(d)	Lagrange's theorem			
45	Density theorem states that						
		Let x and y be any two distinct real		Let x and y be any two distinct real			
	(a)	numbers with $x < y$ , then there exists	(b)	numbers with $x < y$ , then there exists a			
		a rational number r such that	(0)	rational number r such that			
		x < r < y		$x \le r < y$			
		Let x and y be any two distinct real		Let x and y be any two distinct real			
	(c)	numbers with $x < y$ , then there exists	(d)	numbers with $x < y$ , then there exists a			
		a rational number r such that		rational number r such that $r < x < y$			
4.5	-	x < r ≤ y		,			
46	Can	tor Intersection theorem states that		T . (37 D)			
		Let (X,d) be a complete metric	(b)	Let (X,d) be a complete metric space. Let			
	(a)	space. Let $\{F_n\}$ , $n \in N$ be a sequence		$\{F_n\}$ , $n \in N$ be a sequence of non empty			
		of non empty closed subsets of X		closed subsets of X such that			
		such that		$i > F_{n+1} \subseteq F_n$ for all $n \in N$			

	$i > F_{n+1} \subseteq F_n$ for all $n \in N$ $ii > \cap Fn$ , $(n \in N)$ consists of exactly one point.		ii> $\cap$ Fn, (n $\in$ N) consists of at least one point.
(c)	Let $(X,d)$ be a complete metric space. Let $\{F_n\}$ , $n \in N$ be a sequence of non empty closed subsets of $X$ such that $i > F_{n+1} \subseteq F_n$ for all $n \in N$ $ii > \cap Fn$ , $(n \in N)$ consists of minimum one point.	(d)	Let $(X,d)$ be a complete metric space. Let $\{F_n\}$ , $n \in N$ be a sequence of non empty closed subsets of $X$ such that $i > F_{n+1} \subseteq F_n$ for all $n \in N$ $ii > \cap Fn$ , $(n \in N)$ consists more than point.