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MTH634 Topology

Question No : 10 of 41

Which of the following statement is true?

Answer (Please select your correct option)

- All spaces are metrizable
- all spaces are not metrizable.

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MTH634 Topology

Question No : 27 of 41

Let $f : \mathbb{R} \to \mathbb{R}$ be a function defined as $f(x) = x + 1$. Fixed point of f is:

Answer (Please select your correct option)

- 0
- 1
- 2
- no fixed point

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MTH634 Topology MC

Question No : 24 of 41 **Marks: 1 (Budgeted Time Min)**

Consider $\mathbb{R}$ with usual topology. There exits no homomorphism between an open interval of $\mathbb{R}$ and a closed interval of $\mathbb{R}$.

Answer (Please select your correct option)

- True
- False

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MTH634 Topology MC

Question No : 24 of 41 **Marks: 1 (Budgeted Time Min)**

Consider $\mathbb{R}$ with usual topology. There exits no homomorphism between an open interval of $\mathbb{R}$ and a closed interval of $\mathbb{R}$.

Answer (Please select your correct option)

- True
- False

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MTH634 Topology

Question No : 17 of 41

A topological space is a T_1 – space if and only if its each finite subset is

Answer (Please select your correct option)

- a perfect set
- a closed set
- an open set
- none

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TH634 Topology

Question No : 25 of 41

Consider $\mathbb{R}$ with usual topology. Then $A = (0,1) \cup (3,5]$ is disconnected subset of $\mathbb{R}$.

Answer (Please select your correct option)

True

False

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MTH634 Topology

Question No : 14 of 41

Every second countable space is not Lindelof space.

Answer (Please select your correct option)

True

False

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MTH634 Topology

Question No : 15 of 41

Which of the following statement is false.

Answer (Please select your correct option)

- Finite set X with any topology is separable.
- A set X with indiscrete topology is separable.
- ▯ with usual topology is separable.
- ▯ with discrete topology is separable.

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MTH634 Topology

Question No : 19 of 41

Every subspace of T_3 – space is a

Answer (Please select your correct option)

- T_1 – space
- T_2 – space
- T_3 – space
- none

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MTH634 Topology

Question No : 23 of 41

Every compact subspace of a hausdorff space is open.

Answer (Please select your correct option)

- True
- False

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MTH634 Topology

Question No : 8 of 41

Which of the following statement is true?

Answer (Please select your correct option)

- Projection map may or may not be closed.
- Projection map is open.
- Projection map is closed.

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MTH634 Topology

Question No : 21 of 41

□ with usual topology is a T_4 – *space*.

Answer (Please select your correct option)

True

False

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MTH634 Topology

Question No : 11 of 41

Every subspace of a second countable space is second countable.

Answer (Please select your correct option)

true

false

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MTH634 Topology

Question No : 18 of 41

Which of the following statement is false?

Answer (Please select your correct option)

- A nonempty set $X \neq \{x\}$ with indiscrete topology is Hausdorff.
- Every discrete space is Hausdorff.
- Every discrete space is T_0 space.
- Every discrete space is T_1 space

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MTH634 Topology

Question No : 9 of 41 Marks: 1 (Budgeted T

A map $f : (X, \tau_X) \to (Y, \tau_Y)$ such that (i) f is bijective (ii) f is continuous (iii) f is an open map.

Then the map f is called:

Answer (Please select your correct option)

- open map
- homomorphism
- closed map

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MTH634 Topology

Question No : 12 of 41 Marks: 1 (B

For metric d on X, an open ball of radius r with center $x \in X$ is defined as:

Answer (Please select your correct option)

- $B(x,r) = \{y \in X \mid d(x,y) \leq r\}$
- $B(x,r) = \{y \in X \mid d(x,y) > r\}$
- $B(x,r) = \{y \in X \mid d(x,y) < r\}$ ⇦
- none

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MTH634 Topology

Question No : 16 of 41

Which of the following statement is true?

Answer (Please select your correct option)

- Every T_1 space is T_0.
- Every T_0 space is T_1.
- Every Hausdorff space is Normal.
- none

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MTH634 Topology

Question No : 7 of 41 Marks:

A map $f:(X,\tau_X)\to(Y,\tau_Y)$ is an open map iff:

Answer (Please select your correct option)

- the image of each element of a basis β_X of τ_X is an open subset of Y
- the image of each element of a basis β_Y of τ_Y is an open subset of Y
- the image of each open subset of Y is open X
- none

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MTH634 Topology

Question No : 29 of 41

A discrete space is not locally connected.

Answer (Please select your correct option)

True

False

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TH634 Topology

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Question No : 25 of 41

Consider $\mathbb{R}$ with usual topology. Then $A = (0,1) \cup (3,5]$ is disconnected subset of $\mathbb{R}$.

Answer (Please select your correct option)

True

False

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VU Examination Syste...

MTH634 Topology

Question No : 22 of 41

A set X with cofinite topology is compact.

Answer (Please select your correct option)

- True
- False

MTH634 Topology

Question No : 28 of 41

Let C be a connected component of a topological space X, then

Answer (Please select your correct option)

- C is open
- C is closed
- C is infinite
- none

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MTH634 Topology

Question No : 20 of 41

A nonempty set $X \neq (x)$ with indiscrete topology is a

Answer (Please select your correct option)

- $T_0 - space$
- regular space
- Hausdorff space
- none

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MTH634 Topology

Question No : 13 of 41 **Marks: 1 (Budgeted Time Mi**

Let $B_1(x,r_1)$ and $B_2(x,r_2)$ be two open balls centered at x with radii r_1 and r_2 respectively. Then the following statement is true.

Answer (Please select your correct option)

- $B_1(x,r_1) = B_2(x,r_2)$
- either $B_1(x,r_1) \subset B_2(x,r_2)$ or $B_1(x,r_1) \supset B_2(x,r_2)$
- none

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MTH634 Topology

Question No : 30 of 41

The image of connected topological space is path connected.

Answer (Please select your correct option)

- True
- False

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MTH634 Topology

Question No : 26 of 41

Closure of a connected subset is also connected.

Answer (Please select your correct option)

- True
- False

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MTH634 Topology

Question No : 40 of 41

Show that a set X with cofinite topology is compact.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 34 of 41

Define separated sets.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 39 of 41

Show that every second countable space is first countable.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 37 of 41

Show that a discrete space X is separable if and only if X is countable.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 31 of 41

Let $X = \{a, b, c\}$ Write the basis for the discrete topology on X.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 36 of 41

Prove that every subspace of a second countable space is second countable.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 32 of 41

Give one example of second countable space.

Answer (Please click here to Add Answer)

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MTH634 Topology

Question No : 33 of 41

Define T_1 – space.

Answer (Please click here to Add Answer)

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Now B_{pA} is local base at p for I_A and B_{pA} is countable & so A is countable

Every subspace of a second countable space is second countable

Proof: is same as for first countable space.

let $A \subset X$

(X is second countable space)

& so $\exists$

$B = \{ B_A \mid n \in N \} \longrightarrow$ Countable.

Now

$B_A = \{ A \cap B_n \mid n \in N \}$ is a basis for T_A and B_A is Countable

$\Rightarrow$ A is second countable.

Module : 163

Let A and B be two subsets of a topological space (X,T) then A and B are said to be separated sets if and only if

$A \cap B = \phi$ *and* $\acute{A} \cap B = \phi$ *and* $A \cap \acute{B} = \phi$

Let A and B be two subsets of a topological space (X,T) then A and B are said to be separated sets if and only if there exists open subsets U_A and U_B of X containing A and B respectively.

$A \cap U_B = \phi$ *and* $B \cap U_A = \phi$

Let A and B be two subsets of a topological space (X,T) then A and B are said to be separated sets if and only if

$\bar{A} \cap B = \phi$ *and* $A \cap \bar{B} = \phi$

Module : 164

$x \in V_y$.

(Q11) Let $X = \{a, b, c\}$. Write the basis for the discrete topology on X.

Solus- Let $X = \{a, b, c\}$

Consider the set of all singletons i-e

$$B = \{\{a\}, \{b\}, \{c\}\}$$

It is clear that this collection satisfies both the conditions of basis. Let us generate the topology from B.

Following is the topology

$$\mathcal{T} = \{\phi, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}, X\}$$

It is discrete topology.

Show that

I_1.

(Q9) Let $(X, \mathcal{T})$ be a path connected ~~topology~~ & topological space and $f: (X, \mathcal{T}) \longrightarrow (Y, \mathcal{T}')$ be a continuous map, Show that $f(x)$ is path connected.

Answer:-

$$f: (X, \mathcal{T}) \xrightarrow{\text{cont}} (Y, \mathcal{T}')$$

$f(x)$ is path connected

Let $a, b \in f(x)$

$\Rightarrow \exists\ x, y \in X$ s.t.

$f(x) = a$, $f(y) = b$

Now $\because$ X is path connected

So, $\exists\ p: I \xrightarrow[\text{cont}]{} X$ $p(0) = x$, $p(1) = y$

$-q = fop: I \longrightarrow f(x)$

$q(0) = fop(0) = f(p(0)) = f(x) = a$

$q(1) = fop(1) = f(p(1)) = f(y) = b$

$\Rightarrow$ $f(x)$ is path connected

Show that

Q5) A discrete space is seperable if and only if it is countable.

Solu

X, $\mathcal{T}_{dis} = P(X)$

We know that the only dense subset in X is X itself.

So the only choice for A is X s.t

$$\bar{A} = X$$

$\Rightarrow$ X is seperable iff X is countable

(2) $A = X$

Second Countable example

Let X be a countable set with discrete topology. Then $(X, \mathcal{T}_{dis})$ is a second countable Reeall basis for discrete space is.

$$B = \{\{x\} \mid x \in X\}$$

Q Show that a set X with cofinite topology is Compact

Proof: If X is finite, Then

$$\mathcal{T}_{cof} = P(X)$$

$\Rightarrow (X, \mathcal{T}_{cof})$ is compact

But if X is not finite Then

Consider an open cover D of X.

Now Let $\phi \in D \in D$ $\therefore$ D is finite

Now, for every $x \in D^c$

Choose an element of D. D_x containing x.

$\{ D_x \mid x \in D^c \}$ is finite

$\therefore D^c$ is finite

Consider this subcover of D

$$C = \{D\} \cup \{ D_x \mid x \in D^c \}$$

$\rightarrow$ C is a finite cover of D

$\Rightarrow (X, \mathcal{T}_{cof})$ is Compact

Q Every second countable space is first countable.

Proof: Let X be a second countable space.
i-e ∃ B(a basis) s.t B is countable
Now Let $p \in X$ and consider $B_p \subset B$

$$B_p = \{ B_p \mid p \in B_p \} \subset B$$

Now B_p is countable ∵ B is countable
Now B_p is local base at p
$B_p \subset B$ (basis) ∀ $U \in$ ∃ s.t $p \in U$
∃ $B_p \in B$ s.t
$p \in B_p \subset U$

→ B_p is a local base at p
and this exists ∀ $p \in X$
→ X is first countable