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MTH634 Topology

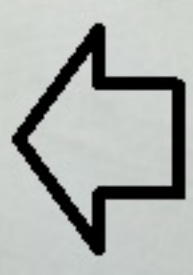
Question No : 10 of 41

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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10

MTH634 Topology

Question No : 27 of 41

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ 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

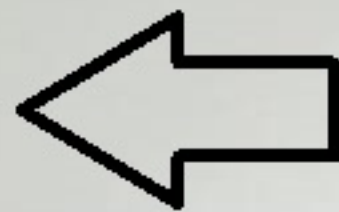
Question No : 24 of 41

Marks: 1 (Budgeted Time Min)

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

Answer (Please select your correct option)

True



False

MTH634 Topology

MC

Question No : 24 of 41

Marks: 1 (Budgeted Time Min)

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

Answer (Please select your correct option)

True



False

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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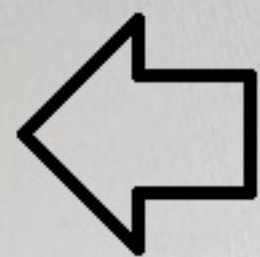
TH634 Topology

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

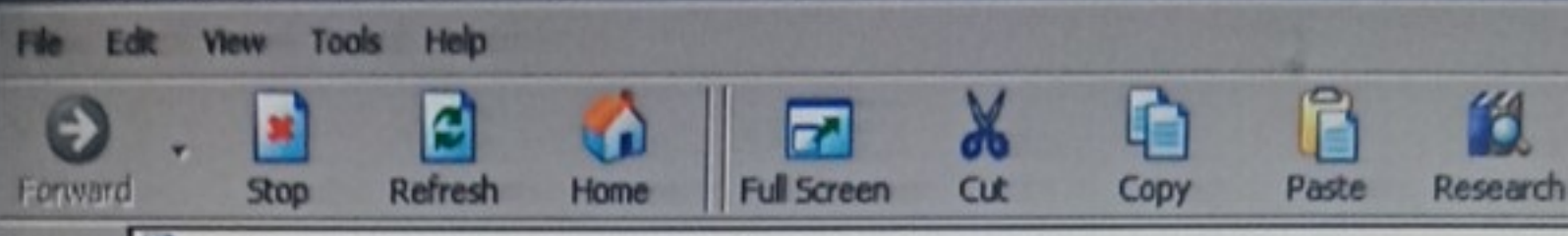
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MTH634 Topology

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.

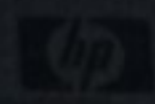
with discrete topology is separable.



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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

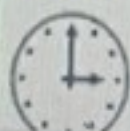
T_2 - space

T_3 - space

none

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MTH634 Topology

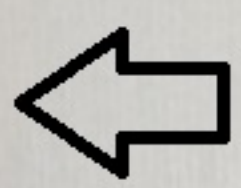
Question No : 23 of 41

Every compact subspace of a hausdorff space is open.

Answer (Please select your correct option)

True

False



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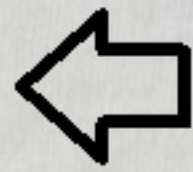
MTH634 Topology

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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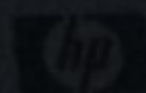
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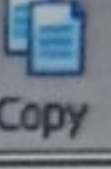
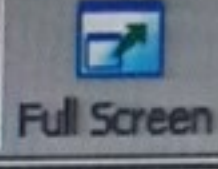
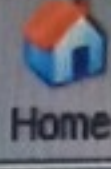
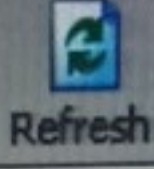
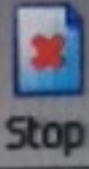
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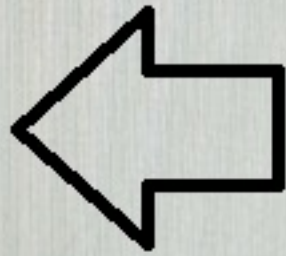
MTH634 Topology

Question No : 21 of 41

with usual topology is a T_4 - space.

Answer (Please select your correct option)

True

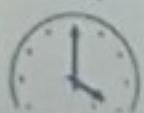


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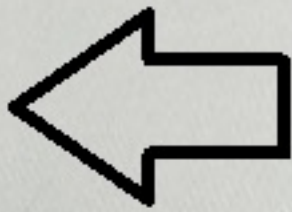
MTH634 Topology

Question No : 11 of 41

Every subspace of a second countable space is second countable.

Answer (Please select your correct option)

true



false

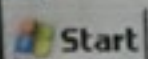
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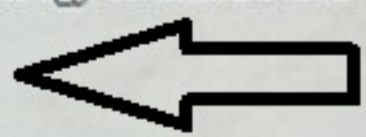
MTH634 Topology

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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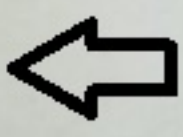
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Question No : 9 of 41

A map $f : (X, \tau_X) \rightarrow (Y, \tau_Y)$ 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

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Question No : 12 of 41

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

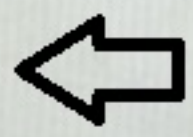
Answer (Please select your correct option)

$B(x,r) = \{y \in X \mid d(x,y) \leq r\}$

$B(x,r) = \{y \in X \mid d(x,y) > r\}$

$B(x,r) = \{y \in X \mid d(x,y) < r\}$

none



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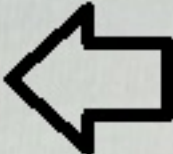
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MTH634 Topology

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

Marks:

Question No : 7 of 41

A map $f : (X, \tau_X) \rightarrow (Y, \tau_Y)$ 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

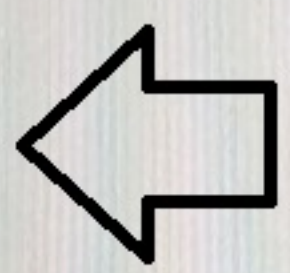
Question No : 29 of 41

A discrete space is not locally connected.

Answer (Please select your correct option)

True

False



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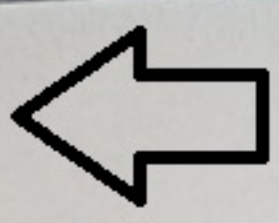
TH634 Topology

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



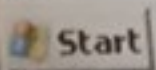
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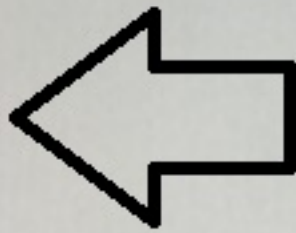
MTH634 Topology

Question No : 22 of 41

A set X with cofinite topology is compact.

Answer (Please select your correct option)

True



False



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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 $X = \{x\}$ with indiscrete topology is a

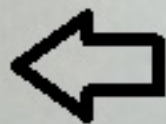
Answer (Please select your correct option)

T_0 - space

regular space

Hausdorff space

none



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MTH634 Topology

Question No : 13 of 41

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

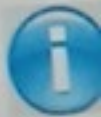


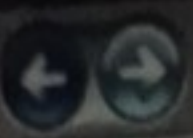
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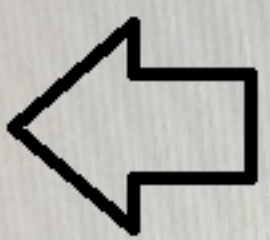
MTH634 Topology

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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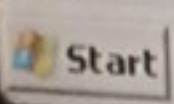
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MTH634 Topology

Question No : 26 of 41

Closure of a connected subset is also connected.

Answer (Please select your correct option)

True



False

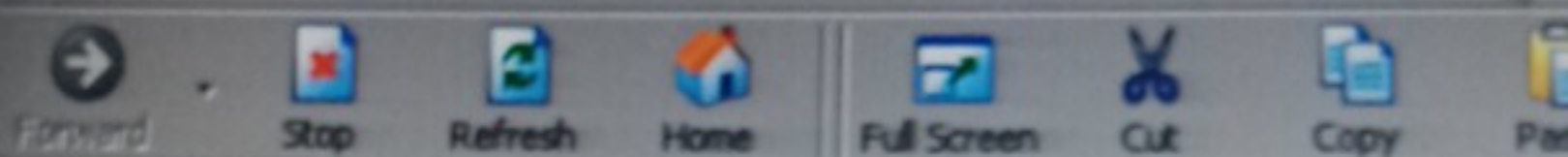


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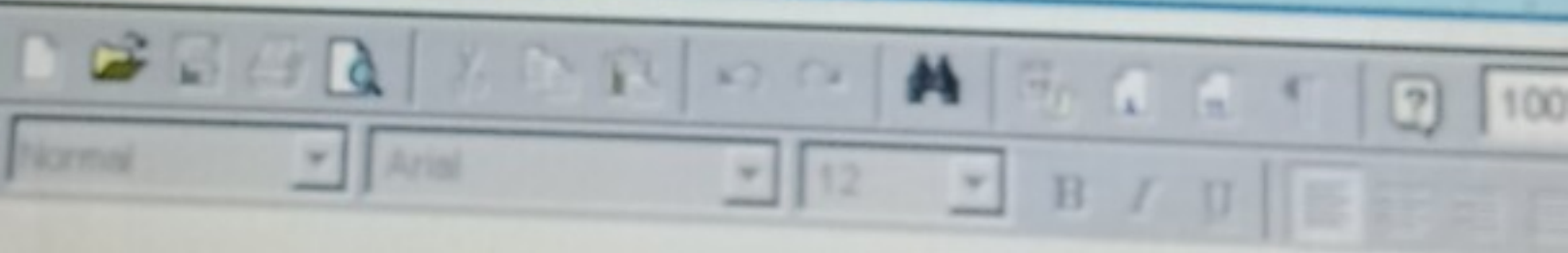
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MTH634 Topology

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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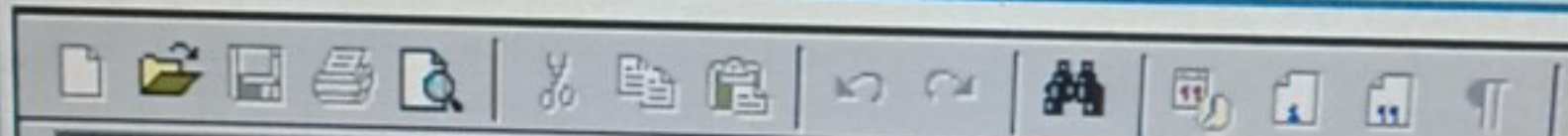
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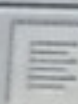
MTH634 Topology

Question No : 34 of 41

Define separated sets.

Answer ([Please click here to Add Answer](#))

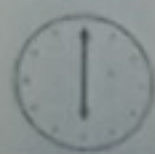


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MTH634 Topology

Question No : 39 of 41

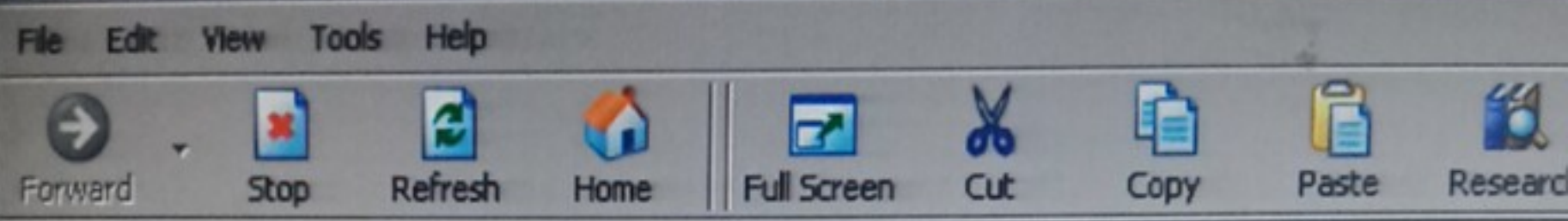
Show that every second countable space is first countable.


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.

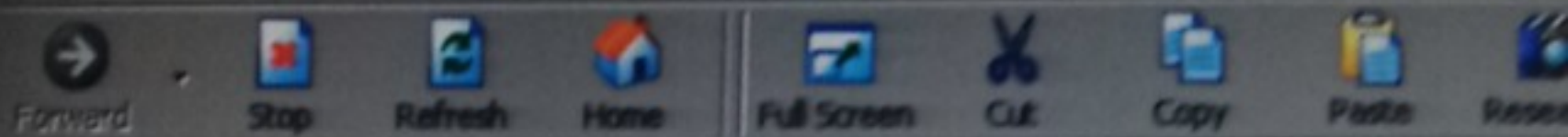
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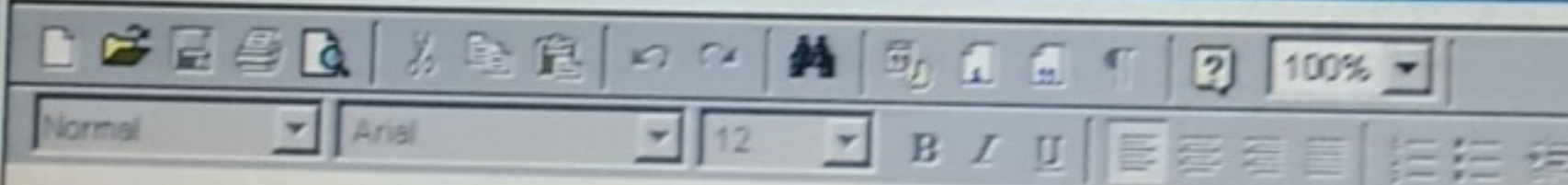
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MTH634 Topology

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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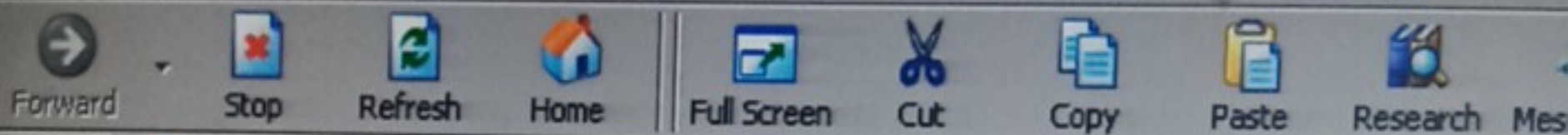
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MTH634 Topology

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 T_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 $A \subset X$
 $(X \text{ is second countable space})$

So $\exists \{B_n \mid n \in \mathbb{N}\} \rightarrow \text{Countable.}$

Now $B_A = \{A \cap B_n \mid n \in \mathbb{N}\}$ 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

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

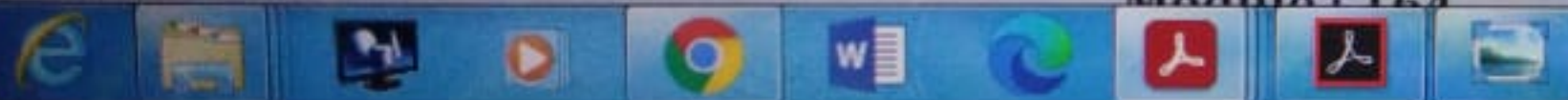
Let A and B be two subsets of a topological space (X, T) then A and B are said to be separated sets if and only if there exists open subsets U_A and U_B of X containing A and B respectively.

$$A \cap U_B = \phi \text{ and } B \cap U_A = \phi$$

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

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

Module : 164



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

Soln- 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

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

It is discrete topology.

Q9 Show that T_1

Q9) Let (X, \mathcal{F}) be a path connected topology & topological space and $f: (X, \mathcal{F}) \rightarrow (Y, \mathcal{F}')$ be a continuous map, Show that $f(X)$ is path connected.

Answer:-

$$f: (X, \mathcal{F}) \xrightarrow{\text{cont}} (Y, \mathcal{F}')$$

$f(X)$ 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,

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

$$-q = f \circ p: I \rightarrow f(X)$$

$$q(0) = f \circ p(0) = f(p(0)) = f(x) = a$$

$$q(1) = f \circ p(1) = f(p(1)) = f(y) = b$$

$\Rightarrow f(X)$ is path connected

Show that

Q4

Q5 A discrete space is separable if and only if it is countable.

Soln

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

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 separable iff X is countable.

Q7 Prove

Let

To

Q:

two

such

se

$$(2) \quad A = X$$

Second Countable example

Let X be a countable set with discrete topology. Then (X, \mathcal{F}_d) is a second countable T_0 space for discrete space is.

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

Q show that a set X with cofinite topology is compact 68

Proof If X is finite, then

$\mathcal{F}_{\text{cof}} = \mathcal{P}(X)$
 $\Rightarrow (X, \mathcal{F}_{\text{cof}})$ is compact

But if X is not finite then

consider an open cover \mathcal{D} of X .

Now let $\emptyset \in \mathcal{D} \in \mathcal{D} \quad \because \mathcal{D}$ is finite

Now, for every $x \in \mathcal{D}^c$
choose an element of \mathcal{D} , D_x
containing x .

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

Consider this subcover of \mathcal{D}

~~$\mathcal{C} = \mathcal{D} \cup \mathcal{D}^c$~~

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

$\rightarrow \mathcal{C}$ is a finite cover of \mathcal{D}

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

Every second countable space is first countable. 67

Proof

Let X be a second countable space.

i.e. $\exists B$ (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

Now B_p is local base at p

$B_p \subset B$ (basis)

$\forall U \ni p$ s.t. $p \in U$

$\exists B_p \in B$ s.t. $p \in B_p \subset U$

$\rightarrow B_p$ is a local base at p

and this exists $\forall p \in X$

$\rightarrow X$ is first countable