Passed

60581

Code – A

Subject Elementary Topology (Reappear) Set —

ANSWER – KEY

1	2	3	4	5	6	7	8	9	10
4	1	3	4	3	4	1	1	1	3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
2	4	2	1	4	1	1	4	3	2
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
3	1	3	1	1	1	4	2	3	1
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
2	3	4	4	1	3	4	1	2	3
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
1	1	2	4	1	1	1	2	1	3

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Revised

60581 Code- B

Subject Elementary Topology Set —

Re-appear

ANSWER – KEY

1	2	3	4	5	6	7	8	9	10
1	1	2	4	1	1	1	2	1	3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
4	1	3	4	3	4	1	1	1	3
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
2	4	2	1	4	1	1	4	3	2
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
3	1	3	1	1	1	4	2	3	1
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
2	3	4	4	1	3	4	1	2	3

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60581

Revised

Code – C

Subject Elementary Topology Re-appear   Set —

ANSWER – KEY

1	2	3	4	5	6	7	8	9	10
2	3	4	4	1	3	4	1	2	3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1	1	2	4	1	1	1	2	1	3
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
4	1	3	4	3	4	1	1	1	3
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
2	4	2	1	4	1	1	4	3	2
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
3	1	3	1	1	1	4	2	3	1

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60581 Code D

Revised

Subject Elementary Topology Set —

Re-appear

ANSWER – KEY

1	2	3	4	5	6	7	8	9	10
3	1	3	1	1	1	4	2	3	1
11	12	13	14	15	16	17	18	19	20
2	3	4	4	1	3	4	1	2	3
21	22	23	24	25	26	27	28	29	30
1	1	2	4	1	1	1	2	1	3
31	32	33	34	35	36	37	38	39	40
4	1	3	4	3	4	1	1	1	3
41	42	43	44	45	46	47	48	49	50
2	4	2	1	4	1	1	4	3	2

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1. Let X be a non-empty set. Let T_1 and T_2 be two topologies on X such that T_1 is strictly contained in T_2. If I : $(X,T_1) \rightarrow (X, T_2)$ is identity map, then:

   (1) both I and I^{-1} are continuous

   (2) both I and I^{-1} are not continuous

   (3) I is continuous but I^{-1} is not continuous

   (4) I is not continuous but I^{-1} is continuous

2. The connected subset of real line with usual topology are --:

   (1) all intervals

   (2) only bounded intervals

   (3) only compact intervals

   (4) only semi-infinite intervals

3. Topological space X is locally path connected space-

   (1) if X is locally connected at each $x \notin X$

   (2) if X is locally connected at some $x \in X$

   (3) if X is locally connected at each $x \in X$

   (4) None of these

4. The topology on real line R generated by left-open right closed intervals (a,b) is:

   (1) strictly coarser then usual topology

   (2) strictly finer than usual topology

   (3) not comparable with usual topology

   (4) same as the usual topology

5. Which of the following is not first countable?

(1) discrete space

(2) indiscrete space

(3) cofinite topological space on R

(4) metric space

6. Let X = {a,b,c} and T_1 = {ϕ, {a}, {b,c}, X}

X* = {x, y, z} and T_2 = {ϕ, {x}, {y,z}, X*}

Then which of the following mapping from X to X* are continuous?

(1) f(a) = x, f(b) = y, f(c) = z

(2) g(a) = x, g(b) = y, g(c) = z

(3) h(a) = z, h(b) = x, h(c) = y

(4) both (1) and (2)

7. A subspace of Hausdorff space is -

(1) Hausdorff space

(2) Discrete space

(3) Closed set

(4) None of these

8. Let X be a topological space satisfy first countability aniom if -

(1) the point $x \in \overline{A}$, closure of A $\subset$ X iff there is a sequence of points of A converging to x

(2) The point $x \in \overline{A}$, closure of A $\subset$ X iff these is a sequence of point of A diverging to x

(3) The point $x \in \overline{A}$, closure of A $\subset$ X iff these is a sequence of point of A converging to zero

(4) None of these

9. Let X be non-empty compact Hausdorff space if every point of X is limit point of X, then:

(1) X is uncountable

(2) X is countable

(3) X is disjoint

(4) none of these

10. Let T_1 and T_2 be topological space. Under which condition a function f : $T_1 \to T_2$ is said to continuous?

(1) iff pre-images of open sets are open

(2) iff pre images of every member of a base of T_2 is an open set in T_1

(3) both (1) and (2)

(4) iff pre-images of closed sets are not closed

11. Let f : R $\to$ R be continuous function and let S be non-empty proper subset of R. Which one of following statements is always true? (Here $\overline{A}$ denote closure of A and A^0 denote interior of A)

(1) $f(s)^0 \subseteq f(s^0)$

(2) $f(\overline{s}) \subseteq \overline{f(s)}$

(3) $f(\overline{s}) \supseteq \overline{f(s)}$

(4) $f(s)^0 \supseteq f(s^0)$

12. Let T_1 = {G $\subseteq$ R : G is finite or R/G is finite} and

T_2 = {G $\subseteq$ R : G is countable or R/G is countable} then -

(1) neither T_1 or T_2 is topology on R

(2) T_1 is topology on R but T_2 is not topology on R

(3) T_2 is topology on R but T_1 is not topology on R

(4) Both T_1 and T_2 are topologies on R

13. Let (X,T) be topological space. Every component of (X,T) is -

(1) open

(2) closed

(3) both (1) and (2)

(4) none of these

14. Which of the following space is T_0-space, T_1-space and T_2-space?

(1) discrete space

(2) indiscrete space

(3) co-finite topological space

(4) both (1) and (2)

15. A finite space with cofinite topology is-

(1) separable

(2) first-countable

(3) second-countable

(4) All of above

16. A sub-basis T for topology X is collection of subsets of X-

(1) whose union equals X

(2) whose union is subset of X

(3) whose union is superset of X

(4) none of these

17. Every closed interval of real line R is -

(1) uncountable

(2) countable

(3) disjoint

(4) none of these

18. Which of the following is not true?

(1) if $A \subseteq B$ and $A^0 \subseteq B^0$

(2) every limit point is an adherent point

(3) $(A \cap B)^0 = A^0 \cap B^0$

(4) $(A \cup B)^0 \subseteq A^0 \cup B^0$

19. If Y is subspace of X. If A is closed in Y and Y is closed in X, then-

(1) A is semi-closed in X

(2) A is open in X

(3) A is closed in X

(4) none of these

20. If T_1 and T_2 are two topologies on non-empty set X, then which of the following is a topological space-

(1) $T_1 \cup T_2$

(2) $T_1 \cap T_2$

(3) T_1 / T_2

(4) none of these

21. Which of the following statement is true about lower limit topology on R?

(1) it is first countable

(2) it is not separable

(3) it is second countable

(4) none of above

22. If X is topological space, then-

(1) each path component of X lies in component of X

(2) some path component of X lies in component of X

(3) each path component of X does not lie in component of X

(4) none of these

23. Let X={a,b,c} and T= {ϕ, {a}, {b,c}, X} which of the following is true?

(1) d({A}) = {B}

(2) d({c}) = {a}

(3) d({b,c}) = {b,c}

(4) d({a,c}) = {c}

24. Let (X,T) is given topological space, $A \subset X$, then closure of A-

(1) is the intersection of all closed sets containing A

(2) is the union of all closed sets containing A

(3) is the intersection of all open sets containing A

(4) none of these

25. If Y is subspace of X, $A \subset Y$ and $\overline{A}$ is closure of A in X then closure of A in Y-

(1) is equal to $A \cap Y$

(2) is equal to $A \cup Y$

(3) is equal to Y

(4) none of these

26. Suppose X = {α, β, δ} and

let T_1 = {ϕ, X, {α}, {α,β}} and

T_2 = {ϕ, X, {α}, {β,δ}}

then -

(1) both $T_1 \cap T_2$ and $T_1 \cup T_2$ are topologies

(2) neither $T_1 \cap T_2$ nor $T_1 \cup T_2$ is topology

(3) $T_1 \cup T_2$ is topology but $T_1 \cap T_2$ is not a topology

(4) $T_1 \cap T_2$ is topology but $T_1 \cup T_2$ is not topology

27. Let E be connected subset of R with atleast two elements. Then number of elements in E is-

(1) exactly two

(2) more than two but finite

(3) countably infinite

(4) uncountable

28. Let T be topology on non-empty set X. Under which condition topological space (X,T) is connected-

(1) iff these exists no non-empty subsets of X which are both open and closed

(2) iff these exists no non-empty proper subset of X which are both open and closed

(3) iff these exists non-empty proper subsets of X which are both open and closed

(4) iff these exists non-empty subsets of X which are both open and closed

29. Let X, Y be topological space and f : X $\rightarrow$ Y be continuous and bijective map. Then f is homomorphism if:

(1) X and Y are compact

(2) X is Hausdorff and Y is compact

(3) X is compact and Y is Hausdorff

(4) X and Y are Hausdorff

30. Under which condition a finite topological space is T_1-space?

(1) iff it is discrete

(2) iff it is indiscrete

(3) both (1) and (2)

(4) none of these

31. Every closed subspace of lindelof space is-

(1) closed

(2) lindelof

(3) both (1) and (2)

(4) none of these

32. Let X be first countable space. Every convergent sequence has a unique limit point iff-

(1) it is T_1-space

(2) it is T_0-space

(3) it is T_2-space

(4) none of these

33. In which space, no finite set has a limit point?

(1) T_0-space

(2) T_2-space

(3) lindelof space

(4) T_1-space

34. Which of the following statement is true?

P : Every T_1-space is T_0-space

Q : Every first - countable is second - countable

R : Every T_0-space is T_1-space

S : Every second-countable is first-countable

(1) P and Q

(2) Q and R

(3) R and S

(4) P and S

35. A subset Y of a topological space X is dense in X if

(1) $\overline{Y} = X$

(2) Y=X

(3) $\overline{Y} \not\subseteq X$

(4) none of these

36. Which of the following space is T_0-space, T_1-space and T_2-space?

(1) indiscrete space

(2) co-finite topological space

(3) discrete space

(4) both (1) and (2)

37. Which of the following space is not connected?

(1) $\{\phi, \{a\}, X\}$ where $X = \{a,b\}$

(2) infinite cofinite topological space

(3) indiscrete space

(4) discrete space with more than one point

38. Let A, B be subsets of topological space (X,T), then which of the following is true?

(1) $d(A \cup B) = d(A) \cup d(B)$

(2) $d(A \cup B) \neq d(A) \cup d(B)$

(3) $d(A \cap B) = d(A) \cap d(B)$

(4) $d(A \cap B) \supseteq d(A) \cap d(B)$

39. A countable product of first countable spaces is:

(1) second - countable

(2) first - countable

(3) not first - countable

(4) third countable

40. Every Hausdorff topological space is:

(1) normal

(2) regular

(3) completely regular

(4) none of these

41. Consider topology T_1 is the topology generated by all unions of intervals of form-

$\{(a,b) : a, b \in R, a \leq b\}$

and T_2 is discrete topology

Then which of the following is true?

(1) T_1 is strictly coarser than T_2

(2) T_1 is finer than T_2

(3) T_2 is finer than T_1

(4) T_1 is coarser than T_2

42. A topological space X is compact if open covering of X contains-

(1) finite subcollection that covers X

(2) infinite subcollection that covers X

(3) finite subcollection that does not cover X

(4) none of these

43. Consider R^2 with usual topology. Let

$S = \{(x,y) \in R^2 : x \text{ is an integer}\}$

Then S is :

(1) open but not closed

(2) both open and closed

(3) neither open nor closed

(4) closed but not open

44. Suppose (X,T) is topological space. Let $(S_n\}_{n\geq 1}$ be sequence of subsets of X. Then-

(1) $(S_1 \cup S_2)^0 = S_1^0 \cup S_2^0$

(2) $(\bigcup_n S_n)^0 = \bigcup_n S_n^0$

(3) $\overline{\bigcup_n S_n} = \bigcup_n \overline{S_n}$

(4) $\overline{S_1 \cup S_2} = \overline{S_1} \cup \overline{S_2}$

45. A subspace of first countable space is-

(1) first countable

(2) not first-countable

(3) second - countable

(4) none of these

46. Let X and Y be topological spaces. A map $f : X \rightarrow Y$ is closed map if :

(1) for every closed set U of X, the set f(U) is closed in Y

(2) for every open set U of X, the set f(U) is closed in Y

(3) for every closed set U of X, the set f(U) is open in Y

(4) none of these

47. Let β and β' be basis for topologies T and T' respectively on X. Then T' is finer than T is equivalent to -

(1) for each $x \in X$ and each basis element $B \in \beta$ containing x, these is basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(2) for some $x \in X$ and each basis element $B \in \beta$ containing x, these is a basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(3) for $x \in X$ and basis element $B \in \beta$ containing x, these is basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(4) none of these

48. A collection G of subsets of topological space satisfies finite intersection condition if for every finite subcollection $\{C_1, C_2, ... C_n\}$ of G, the intersection -

(1) is null set

(2) is not null set

(3) is set G

(4) none of these

49. The product of two Hausdorff space is-

(1) Housdorff space

(2) discrete space

(3) closed set

(4) none of these

50. Let X and Y be topological spaces. Function f is homomorphism if :

(1) function $f : X \rightarrow Y$ is one to one function

(2) function f is continuous

(3) inverse function $f^{-1} : Y \rightarrow X$ is continuous

(4) all of the above

1. Consider topology T_1 is the topology generated by all unions of intervals of form-

   $\{(a,b) : a, b \in R, a \leq b\}$

   and T_2 is discrete topology

   Then which of the following is true?

   (1) T_1 is strictly coarser than T_2

   (2) T_1 is finer than T_2

   (3) T_2 is finer than T_1

   (4) T_1 is coarser than T_2

2. A topological space X is compact if open covering of X contains-

   (1) finite subcollection that covers X

   (2) infinite subcollection that covers X

   (3) finite subcollection that does not cover X

   (4) none of these

3. Consider R^2 with usual topology. Let

   $S= \{(x,y) \in R^2 : x \text{ is an integer}\}$

   Then S is :

   (1) open but not closed

   (2) both open and closed

   (3) neither open nor closed

   (4) closed but not open

4. Suppose (X,T) is topological space. Let $(S_n\}_{n\geq1}$ be sequence of subsets of X. Then-

   (1) $(S_1 \cup S_2)^0 = S_1^0 \cup S_2^0$

   (2) $(\bigcup_n S_n)^0 = \bigcup_n S_n^0$

   (3) $\overline{\bigcup_n S_n} = \bigcup_n \overline{S_n}$

   (4) $\overline{S_1 \cup S_2} = \overline{S}_1 \cup \overline{S}_2$

5. A subspace of first countable space is-

(1) first countable

(2) not first-countable

(3) second - countable

(4) none of these

6. Let X and Y be topological spaces. A map $f : X \to Y$ is closed map if :

(1) for every closed set U of X, the set f(U) is closed in Y

(2) for every open set U of X, the set f(U) is closed in Y

(3) for every closed set U of X, the set f(U) is open in Y

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7. Let β and β' be basis for topologies T and T' respectively on X. Then T' is finer than T is equivalent to -

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(2) for some $x \in X$ and each basis element $B \in \beta$ containing x, these is a basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

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(1) is null set

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(4) none of these

9. The product of two Hausdorff space is-

(1) Housdorff space

(2) discrete space

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10. Let X and Y be topological spaces. Function f is homomorphism if :

(1) function f : $X \rightarrow Y$ is one to one function

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(1) both I and I^{-1} are continuous

(2) both I and I^{-1} are not continuous

(3) I is continuous but I^{-1} is not continuous

(4) I is not continuous but I^{-1} is continuous

12. The connected subset of real line with usual topology are --:

(1) all intervals

(2) only bounded intervals

(3) only compact intervals

(4) only semi-infinite intervals

13. Topological space X is locally path connected space-

(1) if X is locally connected at each $x \notin X$

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(3) if X is locally connected at each $x \in X$

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14. The topology on real line R generated by left-open right closed intervals (a,b) is:

    (1) strictly coarser then usual topology

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15. Which of the following is not first countable?

    (1) discrete space

    (2) indiscrete space

    (3) cofinite topological space on R

    (4) metric space

16. Let $X = \{a,b,c\}$ and $T_1 = \{\phi, \{a\}, \{b,c\}, X\}$

    $X^* = \{x, y, z\}$ and $T_2 = \{\phi, \{x\}, \{y,z\}, X^*\}$

    Then which of the following mapping from X to X* are continuous?

    (1) $f(a) = x$, $f(b) = y$, $f(c) = z$

    (2) $g(a) = x$, $g(b) = y$, $g(c) = z$

    (3) $h(a) = z$, $h(b) = x$, $h(c) = y$

    (4) both (1) and (2)

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    (3) Closed set

    (4) None of these

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(1) the point $x \in \overline{A}$, closure of A Ì X iff there is a sequence of points of A converging to x

(2) The point $x \in \overline{A}$, closure of A Ì X iff these is a sequence of point of A diverging to x

(3) The point $x \in \overline{A}$, closure of A Ì X iff these is a sequence of point of A converging to zero

(4) None of these

19. Let X be non-empty compact Hausdorff space if every point of X is limit point of X, then:

(1) X is uncountable

(2) X is countable

(3) X is disjoint

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(2) iff pre images of every member of a base of T_2 is an open set in T_1

(3) both (1) and (2)

(4) iff pre-images of closed sets are not closed

21. Let f : R ® R be continuous function and let S be non-empty proper subset of R. Which one of following statements is always true? (Here $\overline{A}$ denote closure of A and A^0 denote interior of A)

(1) $f(s)^0 \subseteq f(s^0)$

(2) $f(\overline{s}) \subseteq \overline{f(s)}$

(3) $f(\overline{s}) \supseteq \overline{f(s)}$

(4) $f(s)^0 \supseteq f(s^0)$

22. Let T_1 = {G $\subseteq$ R : G is finite or R/G is finite} and

T_2 = {G $\subseteq$ R : G is countable or R/G is countable} then -

(1) neither T_1 or T_2 is topology on R

(2) T_1 is topology on R but T_2 is not topology on R

(3) T_2 is topology on R but T_1 is not topology on R

(4) Both T_1 and T_2 are topologies on R

23. Let (X,T) be topological space. Every component of (X,T) is -

(1) open

(2) closed

(3) both (1) and (2)

(4) none of these

24. Which of the following space is T_0-space, T_1-space and T_2-space?

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(2) indiscrete space

(3) co-finite topological space

(4) both (1) and (2)

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(3) T_1 / T_2

(4) none of these

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(2) some path component of X lies in component of X

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(4) none of these

33. Let X={a,b,c} and T= {ϕ, {a}, {b,c}, X} which of the following is true?

(1) d({A}) = {B}

(2) d({c}) = {a}

(3) d({b,c}) = {b,c}

(4) d({a,c}) = {c}

34. Let (X,T) is given topological space, $A \subset X$, then closure of A-

(1) is the intersection of all closed sets containing A

(2) is the union of all closed sets containing A

(3) is the intersection of all open sets containing A

(4) none of these

35. If Y is subspace of X, $A \subset Y$ and $\overline{A}$ is closure of A in X then closure of A in Y-

(1) is equal to $A \cap Y$

(2) is equal to $A \cup Y$

(3) is equal to Y

(4) none of these

36. Suppose X = $\{\alpha, \beta, \delta\}$ and

let $T_1 = \{\phi, X, \{\alpha\}, \{\alpha,\beta\}\}$ and

$T_2 = \{\phi, X, \{\alpha\}, \{\beta,\delta\}\}$

then -

(1) both $T_1 \cap T_2$ and $T_1 \cup T_2$ are topologies

(2) neither $T_1 \cap T_2$ nor $T_1 \cup T_2$ is topology

(3) $T_1 \cup T_2$ is topology but $T_1 \cap T_2$ is not a topology

(4) $T_1 \cap T_2$ is topology but $T_1 \cup T_2$ is not topology

37. Let E be connected subset of R with atleast two elements. Then number of elements in E is-

(1) exactly two

(2) more than two but finite

(3) countably infinite

(4) uncountable

38. Let T be topology on non-empty set X. Under which condition topological space (X,T) is connected-

(1) iff these exists no non-empty subsets of X which are both open and closed

(2) iff these exists no non-empty proper subset of X which are both open and closed

(3) iff these exists non-empty proper subsets of X which are both open and closed

(4) iff these exists non-empty subsets of X which are both open and closed

39. Let X, Y be topological space and $f : X \rightarrow Y$ be continuous and bijective map. Then f is homomorphism if:

(1) X and Y are compact

(2) X is Hausdorff and Y is compact

(3) X is compact and Y is Hausdorff

(4) X and Y are Hausdorff

40. Under which condition a finite topological space is T_1-space?

(1) iff it is discrete

(2) iff it is indiscrete

(3) both (1) and (2)

(4) none of these

41. Every closed subspace of lindelof space is-

(1) closed

(2) lindelof

(3) both (1) and (2)

(4) none of these

42. Let X be first countable space. Every convergent sequence has a unique limit point iff-

(1) it is T_1-space

(2) it is T_0-space

(3) it is T_2-space

(4) none of these

43. In which space, no finite set has a limit point?

(1) T_0-space

(2) T_2-space

(3) lindelof space

(4) T_1-space

44. Which of the following statement is true?

P : Every T_1-space is T_0-space

Q : Every first - countable is second - countable

R : Every T_0-space is T_1-space

S : Every second-countable is first-countable

(1) P and Q

(2) Q and R

(3) R and S

(4) P and S

45. A subset Y of a topological space X is dense in X if

(1) $\overline{Y} = X$

(2) Y=X

(3) $\overline{Y} \not\subseteq X$

(4) none of these

46. Which of the following space is T_0-space, T_1-space and T_2-space?

(1) indiscrete space

(2) co-finite topological space

(3) discrete space

(4) both (1) and (2)

47. Which of the following space is not connected?

(1) $\{\phi, \{a\}, X\}$ where $X = \{a,b\}$

(2) infinite cofinite topological space

(3) indiscrete space

(4) discrete space with more than one point

48. Let A, B be subsets of topological space (X,T), then which of the following is true?

(1) $d(A \cup B) = d(A) \cup d(B)$

(2) $d(A \cup B) \neq d(A) \cup d(B)$

(3) $d(A \cap B) = d(A) \cap d(B)$

(4) $d(A \cap B) \supseteq d(A) \cap d(B)$

49. A countable product of first countable spaces is:

(1) second - countable

(2) first - countable

(3) not first - countable

(4) third countable

50. Every Hausdorff topological space is:

(1) normal

(2) regular

(3) completely regular

(4) none of these

1. Every closed subspace of lindelof space is-

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(3) it is T_2-space

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3. In which space, no finite set has a limit point?

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(2) T_2-space

(3) lindelof space

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4. Which of the following statement is true?

P : Every T_1-space is T_0-space

Q : Every first - countable is second - countable

R : Every T_0-space is T_1-space

S : Every second-countable is first-countable

(1) P and Q

(2) Q and R

(3) R and S

(4) P and S

5. A subset Y of a topological space X is dense in X if

(1) $\overline{Y} = X$

(2) Y=X

(3) $\overline{Y} \not\subseteq X$

(4) none of these

6. Which of the following space is T_0-space, T_1-space and T_2-space?

(1) indiscrete space

(2) co-finite topological space

(3) discrete space

(4) both (1) and (2)

7. Which of the following space is not connected?

(1) $\{\phi, \{a\}, X\}$ where $X = \{a,b\}$

(2) infinite cofinite topological space

(3) indiscrete space

(4) discrete space with more than one point

8. Let A, B be subsets of topological space (X,T), then which of the following is true?

(1) $d(A \cup B) = d(A) \cup d(B)$

(2) $d(A \cup B) \neq d(A) \cup d(B)$

(3) $d(A \cap B) = d(A) \cap d(B)$

(4) $d(A \cap B) \supseteq d(A) \cap d(B)$

9. A countable product of first countable spaces is:

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(2) regular

(3) completely regular

(4) none of these

11. Consider topology T_1 is the topology generated by all unions of intervals of form-

$\{(a,b) : a, b \in R, a \leq b\}$

and T_2 is discrete topology

Then which of the following is true?

(1) T_1 is strictly coarser than T_2

(2) T_1 is finer than T_2

(3) T_2 is finer than T_1

(4) T_1 is coarser than T_2

12. A topological space X is compact if open covering of X contains-

(1) finite subcollection that covers X

(2) infinite subcollection that covers X

(3) finite subcollection that does not cover X

(4) none of these

13. Consider R^2 with usual topology. Let

$S = \{(x,y) \in R^2 : x \text{ is an integer}\}$

Then S is :

(1) open but not closed

(2) both open and closed

(3) neither open nor closed

(4) closed but not open

14. Suppose (X,T) is topological space. Let $(S_n\}_{n \geq 1}$ be sequence of subsets of X. Then-

(1) $(S_1 \cup S_2)^0 = S_1^0 \cup S_2^0$

(2) $(\bigcup_n S_n)^0 = \bigcup_n S_n^0$

(3) $\overline{\bigcup_n S_n} = \bigcup_n \overline{S_n}$

(4) $\overline{S_1 \cup S_2} = \overline{S}_1 \cup \overline{S}_2$

15. A subspace of first countable space is-

(1) first countable

(2) not first-countable

(3) second - countable

(4) none of these

16. Let X and Y be topological spaces. A map $f : X \to Y$ is closed map if :

(1) for every closed set U of X, the set f(U) is closed in Y

(2) for every open set U of X, the set f(U) is closed in Y

(3) for every closed set U of X, the set f(U) is open in Y

(4) none of these

17. Let β and β' be basis for topologies T and T' respectively on X. Then T' is finer than T is equivalent to -

(1) for each $x \in X$ and each basis element $B \in \beta$ containing x, these is basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(2) for some $x \in X$ and each basis element $B \in \beta$ containing x, these is a basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(3) for $x \in X$ and basis element $B \in \beta$ containing x, these is basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(4) none of these

18. A collection G of subsets of topological space satisfies finite intersection condition if for every finite subcollection $\{C_1, C_2, ... C_n\}$ of G, the intersection -

(1) is null set

(2) is not null set

(3) is set G

(4) none of these

19. The product of two Hausdorff space is-

(1) Housdorff space

(2) discrete space

(3) closed set

(4) none of these

20. Let X and Y be topological spaces. Function f is homomorphism if :

(1) function $f : X \rightarrow Y$ is one to one function

(2) function f is continuous

(3) inverse function $f^{-1} : Y \rightarrow X$ is continuous

(4) all of the above

21. Let X be a non-empty set. Let T_1 and T_2 be two topologies on X such that T_1 is strictly contained in T_2. If I : $(X,T_1) \rightarrow (X, T_2)$ is identity map, then:

(1) both I and I^{-1} are continuous

(2) both I and I^{-1} are not continuous

(3) I is continuous but I^{-1} is not continuous

(4) I is not continuous but I^{-1} is continuous

22. The connected subset of real line with usual topology are --:

(1) all intervals

(2) only bounded intervals

(3) only compact intervals

(4) only semi-infinite intervals

23. Topological space X is locally path connected space-

(1) if X is locally connected at each $x \notin X$

(2) if X is locally connected at some $x \in X$

(3) if X is locally connected at each $x \in X$

(4) None of these

24. The topology on real line R generated by left-open right closed intervals (a,b) is:

(1) strictly coarser then usual topology

(2) strictly finer than usual topology

(3) not comparable with usual topology

(4) same as the usual topology

25. Which of the following is not first countable?

(1) discrete space

(2) indiscrete space

(3) cofinite topological space on R

(4) metric space

26. Let X = {a,b,c} and T_1 = {ϕ, {a}, {b,c}, X}

X* = {x, y, z} and T_2 = {ϕ, {x}, {y,z}, X*}

Then which of the following mapping from X to X* are continuous?

(1) f(a) = x, f(b) = y, f(c) = z

(2) g(a) = x, g(b) = y, g(c) = z

(3) h(a) = z, h(b) = x, h(c) = y

(4) both (1) and (2)

27. A subspace of Hausdorff space is -

(1) Hausdorff space

(2) Discrete space

(3) Closed set

(4) None of these

28. Let X be a topological space satisfy first countability aniom if -

(1) the point $x \in \overline{A}$, closure of A Ì X iff there is a sequence of points of A converging to x

(2) The point $x \in \overline{A}$, closure of A Ì X iff these is a sequence of point of A diverging to x

(3) The point $x \in \overline{A}$, closure of A Ì X iff these is a sequence of point of A converging to zero

(4) None of these

29. Let X be non-empty compact Hausdorff space if every point of X is limit point of X, then:

(1) X is uncountable

(2) X is countable

(3) X is disjoint

(4) none of these

30. Let T_1 and T_2 be topological space. Under which condition a function f : T_1®T_2 is said to continuous?

(1) iff pre-images of open sets are open

(2) iff pre images of every member of a base of T_2 is an open set in T_1

(3) both (1) and (2)

(4) iff pre-images of closed sets are not closed

31. Let f : R ® R be continuous function and let S be non-empty proper subset of R. Which one of following statements is always true? (Here $\overline{A}$ denote closure of A and A^0 denote interior of A)

(1) $f(s)^0 \subseteq f(s^0)$

(2) $f(\overline{s}) \subseteq \overline{f(s)}$

(3) $f(\overline{s}) \supseteq \overline{f(s)}$

(4) $f(s)^0 \supseteq f(s^0)$

32. Let T_1 = {G ⊆ R : G is finite or R/G is finite} and

T_2 = {G ⊆ R : G is countable or R/G is countable} then -

(1) neither T_1 or T_2 is topology on R

(2) T_1 is topology on R but T_2 is not topology on R

(3) T_2 is topology on R but T_1 is not topology on R

(4) Both T_1 and T_2 are topologies on R

33. Let (X,T) be topological space. Every component of (X,T) is -

(1) open

(2) closed

(3) both (1) and (2)

(4) none of these

34. Which of the following space is T_0-space, T_1-space and T_2-space?

(1) discrete space

(2) indiscrete space

(3) co-finite topological space

(4) both (1) and (2)

35. A finite space with cofinite topology is-

(1) separable

(2) first-countable

(3) second-countable

(4) All of above

36. A sub-basis T for topology X is collection of subsets of X-

(1) whose union equals X

(2) whose union is subset of X

(3) whose union is superset of X

(4) none of these

37. Every closed interval of real line R is -

(1) uncountable

(2) countable

(3) disjoint

(4) none of these

38. Which of the following is not true?

(1) if $A \subseteq B$ and $A^0 \subseteq B^0$

(2) every limit point is an adherent point

(3) $(A \cap B)^0 = A^0 \cap B^0$

(4) $(A \cup B)^0 \subseteq A^0 \cup B^0$

39. If Y is subspace of X. If A is closed in Y and Y is closed in X, then-

(1) A is semi-closed in X

(2) A is open in X

(3) A is closed in X

(4) none of these

40. If T_1 and T_2 are two topologies on non-empty set X, then which of the following is a topological space-

(1) $T_1 \cup T_2$

(2) $T_1 \cap T_2$

(3) T_1 / T_2

(4) none of these

41. Which of the following statement is true about lower limit topology on R?

(1) it is first countable

(2) it is not separable

(3) it is second countable

(4) none of above

42. If X is topological space, then-

(1) each path component of X lies in component of X

(2) some path component of X lies in component of X

(3) each path component of X does not lie in component of X

(4) none of these

43. Let X={a,b,c} and T= {ϕ, {a}, {b,c}, X} which of the following is true?

(1) d({A}) = {B}

(2) d({c}) = {a}

(3) d({b,c}) = {b,c}

(4) d({a,c}) = {c}

44. Let (X,T) is given topological space, $A \subset X$, then closure of A-

(1) is the intersection of all closed sets containing A

(2) is the union of all closed sets containing A

(3) is the intersection of all open sets containing A

(4) none of these

45. If Y is subspace of X, $A \subset Y$ and $\overline{A}$ is closure of A in X then closure of A in Y-

(1) is equal to $A \cap Y$

(2) is equal to $A \cup Y$

(3) is equal to Y

(4) none of these

46. Suppose X = $\{\alpha, \beta, \delta\}$ and

let T_1 = {ϕ, X, {α}, {α,β}} and

T_2 = {ϕ, X, {α}, {β,δ}}

then -

(1) both $T_1 \cap T_2$ and $T_1 \cup T_2$ are topologies

(2) neither $T_1 \cap T_2$ nor $T_1 \cup T_2$ is topology

(3) $T_1 \cup T_2$ is topology but $T_1 \cap T_2$ is not a topology

(4) $T_1 \cap T_2$ is topology but $T_1 \cup T_2$ is not topology

47. Let E be connected subset of R with atleast two elements. Then number of elements in E is-

(1) exactly two

(2) more than two but finite

(3) countably infinite

(4) uncountable

48. Let T be topology on non-empty set X. Under which condition topological space (X,T) is connected-

(1) iff these exists no non-empty subsets of X which are both open and closed

(2) iff these exists no non-empty proper subset of X which are both open and closed

(3) iff these exists non-empty proper subsets of X which are both open and closed

(4) iff these exists non-empty subsets of X which are both open and closed

49. Let X, Y be topological space and $f : X \rightarrow Y$ be continuous and bijective map. Then f is homomorphism if:

(1) X and Y are compact

(2) X is Hausdorff and Y is compact

(3) X is compact and Y is Hausdorff

(4) X and Y are Hausdorff

50. Under which condition a finite topological space is T_1-space?

(1) iff it is discrete

(2) iff it is indiscrete

(3) both (1) and (2)

(4) none of these

1. Which of the following statement is true about lower limit topology on R?

   (1) it is first countable

   (2) it is not separable

   (3) it is second countable

   (4) none of above

2. If X is topological space, then-

   (1) each path component of X lies in component of X

   (2) some path component of X lies in component of X

   (3) each path component of X does not lie in component of X

   (4) none of these

3. Let X={a,b,c} and T= {ϕ, {a}, {b,c}, X} which of the following is true?

   (1) d({A}) = {B}

   (2) d({c}) = {a}

   (3) d({b,c}) = {b,c}

   (4) d({a,c}) = {c}

4. Let (X,T) is given topological space, $A \subset X$, then closure of A-

   (1) is the intersection of all closed sets containing A

   (2) is the union of all closed sets containing A

   (3) is the intersection of all open sets containing A

   (4) none of these

5. If Y is subspace of X, $A \subset Y$ and $\overline{A}$ is closure of A in X then closure of A in Y-

(1) is equal to $A \cap Y$

(2) is equal to $A \cup Y$

(3) is equal to Y

(4) none of these

6. Suppose $X = \{\alpha, \beta, \delta\}$ and

let $T_1 = \{\phi, X, \{\alpha\}, \{\alpha,\beta\}\}$ and

$T_2 = \{\phi, X, \{\alpha\}, \{\beta,\delta\}\}$

then -

(1) both $T_1 \cap T_2$ and $T_1 \cup T_2$ are topologies

(2) neither $T_1 \cap T_2$ nor $T_1 \cup T_2$ is topology

(3) $T_1 \cup T_2$ is topology but $T_1 \cap T_2$ is not a topology

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(2) iff these exists no non-empty proper subset of X which are both open and closed

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9. Let X, Y be topological space and f : X $\rightarrow$ Y be continuous and bijective map. Then f is homomorphism if:
   (1) X and Y are compact
   (2) X is Hausdorff and Y is compact
   (3) X is compact and Y is Hausdorff
   (4) X and Y are Hausdorff
10. Under which condition a finite topological space is T_1-space?
   (1) iff it is discrete
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12. Let X be first countable space. Every convergent sequence has a unique limit point iff-
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   (2) it is T_0-space
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13. In which space, no finite set has a limit point?
   (1) T_0-space
   (2) T_2-space
   (3) lindelof space
   (4) T_1-space

14. Which of the following statement is true?

P : Every T_1-space is T_0-space

Q : Every first - countable is second - countable

R : Every T_0-space is T_1-space

S : Every second-countable is first-countable

(1) P and Q

(2) Q and R

(3) R and S

(4) P and S

15. A subset Y of a topological space X is dense in X if

(1) $\overline{Y} = X$

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(3) $\overline{Y} \not\subseteq X$

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(2) $d(A \cup B) \neq d(A) \cup d(B)$

(3) $d(A \cap B) = d(A) \cap d(B)$

(4) $d(A \cap B) \supseteq d(A) \cap d(B)$

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and T_2 is discrete topology

Then which of the following is true?

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(2) T_1 is finer than T_2

(3) T_2 is finer than T_1

(4) T_1 is coarser than T_2

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Then S is :

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(2) both open and closed

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24. Suppose (X,T) is topological space. Let $(S_n\}_{n\geq 1}$ be sequence of subsets of X. Then-

(1) $(S_1 \cup S_2)^0 = S_1^0 \cup S_2^0$

(2) $(\bigcup_n S_n)^0 = \bigcup_n S_n^0$

(3) $\overline{\bigcup_n S_n} = \bigcup_n \overline{S_n}$

(4) $\overline{S_1 \cup S_2} = \overline{S_1} \cup \overline{S_2}$

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(1) first countable

(2) not first-countable

(3) second - countable

(4) none of these

26. Let X and Y be topological spaces. A map $f : X \rightarrow Y$ is closed map if :

(1) for every closed set U of X, the set f(U) is closed in Y

(2) for every open set U of X, the set f(U) is closed in Y

(3) for every closed set U of X, the set f(U) is open in Y

(4) none of these

27. Let β and β' be basis for topologies T and T' respectively on X. Then T' is finer than T is equivalent to -

(1) for each $x \in X$ and each basis element $B \in \beta$ containing x, these is basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(2) for some $x \in X$ and each basis element $B \in \beta$ containing x, these is a basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(3) for $x \in X$ and basis element $B \in \beta$ containing x, these is basis element $B' \in \beta'$ such that $x \in \beta' \subset B$

(4) none of these

28. A collection G of subsets of topological space satisfies finite intersection condition if for every finite subcollection $\{C_1, C_2, ... C_n\}$ of G, the intersection -

(1) is null set

(2) is not null set

(3) is set G

(4) none of these

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(3) closed set

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30. Let X and Y be topological spaces. Function f is homomorphism if :

(1) function $f : X \rightarrow Y$ is one to one function

(2) function f is continuous

(3) inverse function $f^{-1} : Y \rightarrow X$ is continuous

(4) all of the above

31. Let X be a non-empty set. Let T_1 and T_2 be two topologies on X such that T_1 is strictly contained in T_2. If $I : (X,T_1) \rightarrow (X, T_2)$ is identity map, then:

(1) both I and I^{-1} are continuous

(2) both I and I^{-1} are not continuous

(3) I is continuous but I^{-1} is not continuous

(4) I is not continuous but I^{-1} is continuous

32. The connected subset of real line with usual topology are --:

(1) all intervals

(2) only bounded intervals

(3) only compact intervals

(4) only semi-infinite intervals

33. Topological space X is locally path connected space-

(1) if X is locally connected at each $x \notin X$

(2) if X is locally connected at some $x \in X$

(3) if X is locally connected at each $x \in X$

(4) None of these

34. The topology on real line R generated by left-open right closed intervals (a,b) is:

(1) strictly coarser then usual topology

(2) strictly finer than usual topology

(3) not comparable with usual topology

(4) same as the usual topology

35. Which of the following is not first countable?

(1) discrete space

(2) indiscrete space

(3) cofinite topological space on R

(4) metric space

36. Let X = {a,b,c} and T_1= {ϕ, {a}, {b,c}, X}

X* = {x, y, z} and T_2 = {ϕ, {x}, {y,z}, X*}

Then which of the following mapping from X to X* are continuous?

(1) f(a) = x, f(b) = y, f(c) = z

(2) g(a) = x, g(b) = y, g(c) = z

(3) h(a) = z, h(b) = x, h(c) = y

(4) both (1) and (2)

37. A subspace of Hausdorff space is -

(1) Hausdorff space

(2) Discrete space

(3) Closed set

(4) None of these

38. Let X be a topological space satisfy first countability aniom if -

(1) the point $x \in \overline{A}$, closure of A Ì X iff there is a sequence of points of A converging to x

(2) The point $x \in \overline{A}$, closure of A Ì X iff these is a sequence of point of A diverging to x

(3) The point $x \in \overline{A}$, closure of A Ì X iff these is a sequence of point of A converging to zero

(4) None of these

39. Let X be non-empty compact Hausdorff space if every point of X is limit point of X, then:

(1) X is uncountable

(2) X is countable

(3) X is disjoint

(4) none of these

40. Let T_1 and T_2 be topological space. Under which condition a function f : T_1®T_2 is said to continuous?

(1) iff pre-images of open sets are open

(2) iff pre images of every member of a base of T_2 is an open set in T_1

(3) both (1) and (2)

(4) iff pre-images of closed sets are not closed

41. Let f : R ® R be continuous function and let S be non-empty proper subset of R. Which one of following statements is always true? (Here $\overline{A}$ denote closure of A and A^0 denote interior of A)

(1) $f(s)^0 \subseteq f(s^0)$

(2) $f(\overline{s}) \subseteq \overline{f(s)}$

(3) $f(\overline{s}) \supseteq \overline{f(s)}$

(4) $f(s)^0 \supseteq f(s^0)$

42. Let T_1 = {G ⊆ R : G is finite or R/G is finite} and

T_2 = {G ⊆ R : G is countable or R/G is countable} then -

(1) neither T_1 or T_2 is topology on R

(2) T_1 is topology on R but T_2 is not topology on R

(3) T_2 is topology on R but T_1 is not topology on R

(4) Both T_1 and T_2 are topologies on R

43. Let (X,T) be topological space. Every component of (X,T) is -

(1) open

(2) closed

(3) both (1) and (2)

(4) none of these

44. Which of the following space is T_0-space, T_1-space and T_2-space?

(1) discrete space

(2) indiscrete space

(3) co-finite topological space

(4) both (1) and (2)

45. A finite space with cofinite topology is-

(1) separable

(2) first-countable

(3) second-countable

(4) All of above

46. A sub-basis T for topology X is collection of subsets of X-

(1) whose union equals X

(2) whose union is subset of X

(3) whose union is superset of X

(4) none of these

47. Every closed interval of real line R is -

(1) uncountable

(2) countable

(3) disjoint

(4) none of these

48. Which of the following is not true?

(1) if $A \subseteq B$ and $A^0 \subseteq B^0$

(2) every limit point is an adherent point

(3) $(A \cap B)^0 = A^0 \cap B^0$

(4) $(A \cup B)^0 \subseteq A^0 \cup B^0$

49. If Y is subspace of X. If A is closed in Y and Y is closed in X, then-

(1) A is semi-closed in X

(2) A is open in X

(3) A is closed in X

(4) none of these

50. If T_1 and T_2 are two topologies on non-empty set X, then which of the following is a topological space-

(1) $T_1 \cup T_2$

(2) $T_1 \cap T_2$

(3) T_1 / T_2

(4) none of these