BRAINWARE UNIVERSITY

Term End Examination 2021 - 22
Programme – Master of Science in Mathematics
Course Name – General Topology
Course Code - MSCMC205
(Semester II)

Time allotted : 1 Hrs.15 Min. **Full Marks : 60**

[The figure in the margin indicates full marks.]

Group-A

(Multiple Choice Type Question) 1 x 60=60

Choose the correct alternative from the following :

(1) Which of the following formula is false?

a) $\phi \in \{\phi, \{\phi\}\}$ b) $\phi \subset \{\phi, \{\phi\}\}$

c) $\phi \in \{\{\phi\}\}$ d) $\phi \subset \{\{\phi\}\}$

(2) The set [0,1) in the set R with usual topology is

a) open b) closed

c) both open and closed d) neither open nor closed

(3) The upper limit topology is generated by which of the following form of an interval

a) (a, b) b) [a, b)

c) (a, b] d) [a, b]

(4) The subset of R, which is both open and closed is

a) the empty set b) any finite set

c) the set of all rational d) the set of all irrational

(5) The set $[0,1)$ in the set N with usual sub-space topology is

a) Open b) closed

c) both open and closed d) neither open nor closed

(6) Let $X = \{a,b,c,d\}$. If $T_1 = \{X, \phi, \{a\}, \{b\}, \{a,b,c\}\}$, $T_2 = \{X, \phi, \{a,b\}, \{a,b,c\}, \{c\}\}$ are two topologies on X then

a) T_1 is finer than T_2 b) T_2 is finer than T_1

c) T_1 and T_2 are not comparable d) $T_1 = T_2$

(7) For any set A, $A \cup A'$ is

a) always open b) always closed

c) always both open and closed d) always neither open nor closed

(8) $(0,1]' = ?$

a) $(0,1)$

b) $\{0,1\}$

c) $[0,1]$

d) ϕ

(9) $\left\{1, \frac{1}{2}, \frac{1}{3}, \ldots\right\}' = ?$

a) $[0,1]$

b) $\left\{0, 1, \frac{1}{2}, \frac{1}{3}, \ldots\right\}$

c) $\{0\}$

d) ϕ

(10) $\overline{A \cap B}$

a) $\subset \overline{A} \cap \overline{B}$

b) $= \overline{A} \cap \overline{B}$

c) $\supset \overline{A} \cap \overline{B}$

d) none of these

(11) Let p is an accumulation point of A. If G is an open set containing p then

a) $G \cap A = \phi$

b) $G \cap A \neq \phi$

c) $G \cap (A \setminus \{p\}) = \phi$

d) $G \cap (A \setminus \{p\}) \neq \phi$

(12) $\overline{A^{\circ}} = ?$

a) A

b) A°

c) $\overline{A}$

d) None of these

(13) If p is a boundary points of A. Then which of the following is true?

a) p is in int A

b) p is in ext A

c) p is in both int A and ext A

d) p is neither in int A nor in ext A

(14) Let $X = \{a, b, c, d\}$. Then which of the following collections of subsets is structure on X?

a) $\{\phi, X, \{a,b\}, \{c\}\}$

b) $\{\phi, X, \{a,b\}, \{b,c\}\}$

c) $\{\phi, X, \{a,b\}, \{c,d\}\}$

d) $\{\phi, X, \{a,b\}, \{c\}, \{d\}\}$

(15) Which of the following sets are closed in R with co-finite topology?

a) Z

b) Q

c) R\Q

d) {1,2,3}

(16) The set $\{0\} \cup \left\{\frac{1}{n} : n \text{ is a positive integer}\right\}$ in the set R with usual topolc

a) open

b) closed

c) both open and closed

d) neither open nor closed

(17) Every finite subset of R with usual topology

a) open

b) closed

c) both open and closed

d) neither open nor closed

(18) Let X be a topological space and T_1 and T_2 are two topology on X. Suppose T_1 is not co mparable to T_2. Then, which of the following is true?

a) Any open set of T_1 is also an open set of T_2.

b) Any open set of T_2 is also an open set of T_1.

c) Any closed set of T_1 is a closed set of T_2.

d) Other

(19)

Let $X = \{a, b, c\}$. If $T_1 = \{X, \phi, \{a\}, \{a, b\}\}$, $T_2 = \{X, \phi, \{a, b\}\}$ are two topo
then

a) T_1 is finer than T_2

b) T_2 is finer than T_1

c) T_1 and T_2 are not comparable

d) $T_1 = T_2$

(20)

Let $X = \{a, b, c\}$. If $T_1 = \{X, \phi\}$, $T_2 = \{X, \phi, \{a, b\}\}$ are two topologies on

a) T_1 is finer than T_2

b) T_2 is finer than T_1

c) T_1 and T_2 are not comparable

d) $T_1 = T_2$

(21) Let $X = \{a, b, c, d\}$. If $T_1 = \{X, \phi, \{a\}, \{b\}, \{a, b, c\}\}$,
$T_2 = \{X, \phi, \{a, b\}, \{a, b, c\}, \{c\}, \{a\}, \{b\}\}$ are two topologies on X then

a) T_1 is weaker than T_2

b) T_2 is weaker than T_1

c) T_1 and T_2 are not comparable

d) $T_1 = T_2$

(22) Let X be a discrete finite topological space with 4 elements. Then the number of open set s of X is

a) 2

b) 4

c) 8

d) 16

(23) Let X be a discrete finite topological space with 4 elements. Then the number of closed se ts of X is

a) 2

b) 4

c) 8

d) 16

(24) Let X be an indiscrete finite topological space with 5 elements. Then the number of close d sets of X is

a) 2

b) 5

c) 10

d) 32

(25) Let X be an indiscrete finite topological space with 5 elements. Then the number of subse ts of X, which are neither open nor closed is

a) 0

b) 2

c) 10

d) 30

(26)

Let $X = \left\{ \frac{1}{n} : n \in Z \right\}$ with co-finite topology. Then the number of open s

a) zero

b) finite

c) countable

d) uncountable

(27) The set of all interior points of any set A in a topological space is:

a) always open

b) always closed

c) always both open and closed

d) always neither open nor closed

(28) The set of interior points of A is:

a) the largest open set containing A
b) the smallest open set containing A
c) the largest open set contained in A
d) the smallest open set contained in A

(29) Interior set of the set Q of all rational number is:

a) Q
b) R
c) R\Q
d) Empty set

(30) Closure set of the set Q of all rational number is:

a) Q
b) R
c) R\Q
d) Empty set

(31) Closure set of the set R\Q of all irrational number is:

a) Q
b) R
c) R\Q
d) Empty set

(32) $\overline{A \cup B}$

a) $\subset \overline{A} \cup \overline{B}$
b) $= \overline{A} \cup \overline{B}$
c) $\supset \overline{A} \cup \overline{B}$
d) Other

(33) Which of the following relation is always true in a topological space?

a) second countable imply first countable
b) first countable imply second countable
c) second countable imply separable
d) Lindelofness imply compactness

(34) Any subspace of a second countable space is:

a) always second countable
b) may not be first countable
c) may not be second countable
d) may not be separable

(35) Derived set of the set Q of all rational number is:

a) Q
b) R
c) R\Q
d) Empty set

(36) Which of the following topological space is not first countable under usual subspace topo logy?

a) Q
b) R
c) Z
d) None of these

(37) Which of the following topological space is not second countable under usual subspace to pology?

a) Q
b) R
c) R\Q
d) None of these

(38) $ext(A) = ?$

a) $\text{int}(A)$
b) $\text{int}(A^c)$
c) $A \setminus \text{int}(A)$
d) $A^c \setminus \text{int}(A)$

(39) The boundary of (0,1) is

a) (0, 1)
b) {0,1}
c) {0}
d) {1}

(40) Which of the following is not a neighbourhood of 0 under usual topology?

a) (0, 1)
b) [-0,5,1)
c) [-1,1]
d) (-1, 1)

(41)

Let $f: X \to Y$ be a continuous map and V is a closed subset of Y. Then

a) open in X
b) closed in X
c) open in Y
d) closed in Y

(42) Let $f: X \to Y$ be a continuous map and X and Y are homeomorphic via f. Then f^{-1} is

a) always continuous
b) always discontinuous
c) may not be continuous
d) No conclusion

(43) Which of the following is a topological property?

a) length
b) boundedness
c) completeness
d) connectedness

(44) Which of the following is not homeomorphic to the space [0,1]?

a) (0,1)
b) [2,3]
c) [0, 1)U(0.5, 2]
d) None of these

(45) Which of the following is not true in a metric space?

a) compact imply countably compact
b) sequentially compact imply countably compa ct
c) compact imply sequentially compact
d) countably compact imply compact

(46) A closed subset of a compact set is

a) always open
b) always connected
c) always compact
d) always bounded

(47) A mapping $f: X \to Y$ is said to be an open map if

a) it sends an open set to an open set
b) it sends an open set to entire Y set
c) the inverse function sends an open set an ope n set
d) the inverse function sends an open set to the e ntire X

(48) A function which maps every open set to an open set is called a/an

a) continuous map
b) open map
c) closed map
d) clopen map

(49) A function which maps every singleton set of a discrete topological space to an open sets in any topological space is called a/an

a) continuous map
b) open map
c) closed map
d) clopen map

(50) If the inverse image of every closed set is closed then the mapping is called

a) continuous map
b) open map
c) closed map
d) clopen map

(51) Which of the following is false if two spaces are homeomorphic? There exists a

a) onto continuous function between them
b) one-one continuous function between them
c) both one-one and onto continuous function be tween them
d) no onto continuous function between them

(52) Which of the following set is homeomorphic to (0, 1)?

a) Any open set in R
b) [0, 1]
c) [0, 1)
d) (-10, 2021)

(53) The identity function from a topological space (X, S) to (Y, T) is continuous if

a) T is finer than S
b) S is finer than T
c) T is not comparable to S
d) T=S

(54) Let F be a continuous function then the inverse image of every members of subbase is

a) open
b) closed
c) both open and closed
d) neither open nor closed

(55) Let f be a function from a topological space to the unit interval [0, 1]. Then

a) f is always continuous
b) f is an open map
c) f is a closed map
d) None of these

(56) A function $f: \mathrm{X} \to \mathrm{X}$ is continuous if for every subset A of X

a) $f(\overline{A}) = \overline{f(A)}$
b) $f(\overline{A}) \subset \overline{f(A)}$
c) $f(\overline{A}) \supset \overline{f(A)}$
d) $f(\overline{A}) \cap \overline{f(A)} = \phi$

(57) A function f from X to X is continuous if

a) f is continuous at every points in X
b) f is not continuous at some points in X
c) f^{-1} is continuous at every point in X
d) Other

(58) If $f(x) = x^2$ then $f(-1, 1) = ?$

a) is an open interval
b) lower closed upper open interval
c) lower open upper closed interval
d) open set

(59) Which of the following is not topologically invariant?

a) accumulation point
b) interior point
c) boundary point
d) None of these

(60) If f is an open map if for every subset A of X

a) $f(A^\circ) = f(A)^\circ$
b) $f(A^\circ) \subset f(A)^\circ$
c) $f(A^\circ) \supset f(A)^\circ$
d) $f(A^\circ) \cap f(A)^\circ = \phi$