BRAINWARE UNIVERSITY

Term End Examination 2021 - 22
Programme – Bachelor of Technology in Computer Science & Engineering
Course Name – Discrete Mathematics
Course Code - PCC-CS404
(Semester IV)

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) According to De-Morgan's law $[A \cup (B \cap C)]^c$

a) $A^c \cap (B \cap C)$ b) $A^c \cap (B^c \cup C^c)$
c) $A^c \cup (B^c \cap C^c)$ d) none of these

(2) An one-to-one function is also known as

a) injective function b) surjective function
c) bijective function d) None of these

(3) Let R be a symmetric and transitive relation on a set A. If

a) R is reflexive, then a partial order b) R is reflexive, then a equivalence relation
c) R is not reflexive, then a equivalence relation d) None of these

(4) Two finite sets have m and n element respectively. The total number of subsets of first set is 2 times the total number of sub sets of the second set. Then the possible values of m and n respectively are

a) 5, 2 b) 4, 7
c) 7, 6 d) 2, 5

(5) The relation { (1,2), (1,3), (3,1), (1,1), (3,3), (3,2)} on {1, 2, 3, 4} is

a) Reflexive b) Symmetric
c) Transitive d) Asymmetric

(6) Which is the correct statement about the function $f: \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(x) = 2x$?

a) $f(x)$ is one-to-one and onto b) $f(x)$ is one-to-one but not onto
c) $f(x)$ is not one-to-one but onto d) $f(x)$ is neither one-to-one nor onto

(7) How many reflexive relations are possible on a set with n elements?

a) $2^{n(n+1)/2}$ b) $2^{n(n-1)}$
c) 2^n d) 2^{n+2}

(8) If $S = \{\emptyset\}$ then power set of S is _____.

a) $\{\emptyset\}$ b) $\emptyset$
c) $\{\emptyset, \{\emptyset\}\}$ d) None of these

(9) A relation on a non-empty set A is a

a) a subset of A b) a subset of AXA
c) function on A d) None of these

(10) If f(x) = $\tan^{-1}$(x) and g(x) = tan(x), then (gof)(x) =

a) $\tan^{-1}$xtan(x) b) $\tan^{-1}$xcot(x)
c) x d) $\tan^{-1}$xsin(x)

(11) The number of elements in the power set of the set {a, b} is

a) 2 b) 4
c) 6 d) 8

(12) A survey shows that 70% of the Indian like mango wheres 82% like apple. If x% of Indian like both mango and apples, then

a) $x = 52$
b) $52 \le x \le 70$
c) $x = 70$
d) $70 \le x \le 82$

(13) If $X \cup \{3,4\} = \{1,2,3,4,5,6\}$ then which of the following is true

a) Smallest set X = {1,2,5,6}
b) Smallest set X= {1,2,3,5,6}
c) Smallest set X= {1,2,3,4}
d) Greatest set X= {1,2,3,4}

(14) The class $[-11]$ in Z_5 is equal to

a) [1]
b) [4]
c) [0]
d) None of these

(15) Which of the following is a countably infinite set?

a) Z
b) R
c) {2}
d) No such set exist

(16) If gcd of two positive integers is 3 and the product is 54, then the lcm of that two integers is

a) 17
b) 12
c) 6
d) 18

(17) The number of elements in the set Z_n is

a) $n-1$
b) n
c) $n+1$
d) 1

(18) Let R be a reflexive relation of a finite set A having n elements and let there be m ordered pairs in R. Then

a) $m \ge n$
b) $m \le n$
c) $m = n$
d) None of these

(19) Let R be a relation in N defined by $R = \{(1+x, 1+x^2) : x \le 5, x \in N\}$ which of the following is false?

a) Domain of R = {2,3,4,5,6}
b) Range of R = {2,5,10,17,26}
c) R contains 5 elements
d) R is reflexive

(20) The number of even prime is

a) 1
b) 2
c) 0
d) infinitely many

(21) The domain of the function f, where $f(x) = \frac{1}{|x|+1}$ is

a) R
b) R\{1}
c) R\{-1,1}
d) None of these

(22) The number of relation from a set of m elements to a set of n elements is

a) mn
b) 2^{mn}
c) 2^{m+n}
d) None of these

(23) Range of f, where $f(x) = \sin\frac{1}{x}$ is

a) [-1, 1]
b) R
c) [-1,1]\{0}
d) R\{0}

(24) Let R be the relation over the set $N \times N$ and is defined by $(a,b)R(c,d) \Rightarrow a+d = b+c$ then R is

a) Reflexive only
b) Symmetric only
c) Transitive only
d) An equivalence relation

(25) The inverse of the function $f : N \to N$ defined by $f(x) = 2x$ is

a) $g(x) = \frac{x}{2},\ x \in N$
b) $f(x) = 2x, x \in N$
c) invertible
d) Does not exist

(26) We write $a \equiv b \pmod m$ is m divides $a - b$. If $x + 3 \equiv 0 \pmod 5$, then $x =$

a) 3
b) 5
c) 2
d) 0

(27) The inverse of $\frac{7^x - 7^{-x}}{7^x + 7^{-x}}$ is

a) $\frac{1}{2}\log_7\frac{1+x}{1-x}$

b) $\log_7\frac{1-x}{1+x}$

c) $\log_{\frac{1}{2}}\frac{1-x}{1+x}$

d) $\frac{1}{2}\log_e\frac{1+x}{1-x}$

(28) The number of three digit number that can be formed from the digits 1,3,5,7 is,

a) 24

b) 6

c) 4

d) 64

(29) If n pigeonholes are occupied by n+1 pigeons, then at least _____ number of hole is occupied by more than one pigeon.

a) 2

b) 1

c) 3

d) None of these

(30) The least number of people 4 of whom will have same birthday of the week is,

a) 18

b) 42

c) 28

d) 22

(31) A farmer buys 3 cows, 2 pigs, and 4 hens from a man who has 6 cows, 5 pigs, and 8 hens. The number *m* of choices that the farmer has:

a) 2000

b) 14000

c) 200

d) 1400

(32) If ${}^nC_1$, ${}^nC_2$ and ${}^nC_3$ are in A.P., the value of n is

a) 6

b) 7

c) 8

d) 4

(33) The number of words of 5 different letters that can be formed by taking 2 letters from the word BOX and 3 letters from the word TABLE is

a) 120

b) 30

c) 3600

d) None of these

(34) The number of distinct permutations that can be formed from all the letters of the word UNUSUAL is

a) 5040

b) 840

c) 210

d) 35

(35) Find the number of combinations of 4 objects, *A*, *B*, *C*, *D*, taken 3 at a time.

a) 3

b) 4

c) 16

d) 12

(36) Find the number *m* of committees of 5 with a given chairperson that can be selected from 12 people.

a) 495

b) 3960

c) 4950

d) None of these

(37) Find the number of ways a coin can be tossed 6 times so that there is exactly 3 heads and no two heads occur in a row.

a) 22

b) 20

c) 7

d) None of these

(38) $\neg(p \vee q) \vee (p \wedge \neg q) \equiv$

a) $\neg p$

b) p

c) $\neg q$

d) q

(39) The statement [~p v (p → q)] → ~p is a _____.

a) Tautology

b) Contingency

c) Contradiction

d) None of these

(40) The truth value of the statement x^2=x holds for all real values of x is

a) T

b) F

c) Neither T nor F

d) none of these

(41) If p:"anil is rich" and q:"kanchan is poor" then the symbolic from the statement "Either Anil or Kanchan is rich" is

a) $p \vee q$

b) $p \vee \neg q$

c) $\neg p \vee q$

d) $\neg(p \vee q)$

(42) If $p \leftrightarrow q \equiv (p \rightarrow q) \wedge r$, then r is

a) $p \rightarrow q$

b) $\neg p$

c) $q \rightarrow p$

d) $\neg q$

(43) The negation of "All students live in dormitories" is

a) All students do not live in dormitories.

b) No student live in dormitories.

c) One student does not live in dormitories.

d) Some students do not live in dormitories.

(44) Let P:IfSahil bowls, Saurabh hits a century. ,Q: If Raju bowls , Sahil gets out on first ball. Now if P is true and Q is false then which of the following can be true?

a) Raju bowled and Sahil got out on first ball
b) Raju did not bowled
c) Sahil bowled and Saurabh hits a century
d) Sahil bowled and Saurabh got out

(45) "$\forall x \in \mathbb{R}$ such that $x^2 = 4$" is equivalent to

a) If x is real number then $x^2 = 4$
b) Some real numbers have square 4
c) Square of no real number is 4
d) None of these

(46) Inverse of "$\neg p \rightarrow q$" is

a) $p \rightarrow q$
b) $\neg p \rightarrow \neg q$
c) $p \rightarrow \neg q$
d) $\neg q \rightarrow \neg p$

(47) $p \rightarrow q$ is logically equivalent to

a) $\neg p \vee \neg q$
b) $p \vee \neg q$
c) $\neg p \vee q$
d) $\neg p \wedge q$

(48) If $P(n): 3^n < n!$, $n \in \mathbb{N}$, then P(n) is true

a) for $n \geq 6$
b) for $n \geq 7$
c) for $n \geq 3$
d) for all n

(49) By induction hypothesis, the series $1^2 + 2^2 + 3^2 + \ldots + p^2$ can be proved equivalent to

a) $\frac{p(p+1)}{2}$
b) $\left(\frac{p(p+1)}{2}\right)^2$
c) $\frac{p(p+1)}{4}$
d) $\frac{p(p+1)(2p+1)}{6}$

(50) Let $*$ be a binary operation on a non-empty set S. Then $(S,*)$ is called a

a) groupoid
b) semi-group
c) monoid
d) group

(51) If $(G,.)$ is a group with identity e such that $a^2 = e$, $\forall a \in G$, then G is

a) an abelian group
b) a non-abelian group
c) non-associative
d) none of these

(52) The inverse of the element $-i$ in the multiplicative group $\{-1, 1, -i, i\}$, where $i^2 = -1$

a) i
b) $-i$
c) 1
d) -1

(53) The identity element in the multiplicative group $\{-1, 1, -i, i\}$, where $i^2 = -1$

a) i
b) $-i$
c) 1
d) -1

(54) A monoid $(M,+)$ is called a group if

a) $a + b = b + a = e$
b) $a + (b + c) = (a + b) + c$
c) $a + b = b + a \forall a, b \in M$
d) $a + b \in M$, $\forall a, b \in M$

(55) The order of the additive group $(Z,+)$

a) 1
b) Finite but more than 1
c) Infinite
d) $(Z,+)$ does not formed a group

(56) If $(G,.)$ be a group then $(ab)^{-1} = ?$

a) $a^{-1}b$
b) ab^{-1}
c) $a^{-1}b^{-1}$
d) $b^{-1}a^{-1}$

(57) The number of elements in the symmetric group S_3 is

a) 1
b) 3
c) 6
d) 9

(58) The units of the ring $(Z_6,+,.)$ are

a) $\bar{1}, \bar{3}$
b) $\bar{1}, \bar{5}$
c) $\bar{1}, \bar{4}$
d) None of these

(59) The order of the element $\bar{5}$ in the group $(Z_{35},+)$ is-

a) 1
b) 5
c) 6
d) 7

(60) Inverse of the element $\bar{5}$ in the group $(Z_7, +)$ is-

a) $\bar{1}$
b) $\bar{2}$
c) $\bar{3}$
d) $\bar{5}$