**2024 CS Maths**

Q.1 If two distinct non-zero real variables x and y are such that (x + y) is proportional

to (x − y) then the value of x/y

(A) depends on xy

(B) depends only on x and not on y

(C) depends only on y and not on x

(D) is a constant

Q.2 Consider the following sample of numbers:

9, 18, 11, 14, 15, 17, 10, 69, 11, 13

The median of the sample is

(A) 13.5

(B) 14

(C) 11

(D) 18.7

Q.3 The number of coins of ₹1, ₹5, and ₹10 denominations that a person has are in the

ratio 5:3:13. Of the total amount, the percentage of money in ₹5 coins is

(A) 21%

(B) 

(C) 10%

(D) 30%

Q.4 For positive non-zero real variables p and q, if



then, the value of  is

(A) 79

(B) 81

(C) 9

(D) 83

Q.5 Let f: R → R be a function such that f(x) = max{x, x^3}, x ∈ R , where R is the

set of all real numbers. The set of all points where f(x) is NOT differentiable is

(A) {−1, 1, 2}

(B) {−2, −1, 1}

(C) {0, 1}

(D) {−1, 0, 1}

Q.6 The product of all eigenvalues of the matrix is

(A) −1

(B) 0

(C) 1

(D) 2

Q.7 Consider a permutation sampled uniformly at random from the set of all

permutations of {1, 2, 3, ⋯ , n} for some n ≥ 4. Let X be the event that 1 occurs

before 2 in the permutation, and Y the event that 3 occurs before 4. Which one of

the following statements is TRUE?

(A) The events X and Y are mutually exclusive

(B) The events X and Y are independent

(C) Either event X or Y must occur

(D) Event X is more likely than event Y

Q.8 Let A and B be two events in a probability space with P(A) = 0.3, P(B) = 0.5,

and P (A ∩ B) = 0.1. Which of the following statements is/are TRUE?

(A) The two events A and B are independent

(B) P (A ∪ B) = 0.7

(C)  = 0.2, where  is the complement of the event B

(D)  = 0.4, where  and  are the complements of the events A and B, respectively

Q.9 Let A and B be non-empty finite sets such that there exist one-to-one and onto

functions (i) from A to B and (ii) from A × A to A ∪ B. The number of possible

values of |A| is \_\_\_\_\_\_\_\_\_\_

Q.10 Let G be a directed graph and T a depth first search (DFS) spanning tree in G that

is rooted at a vertex v. Suppose T is also a breadth first search (BFS) tree in G,

rooted at v. Which of the following statements is/are TRUE for every such graph G

and tree T?

(A) There are no back-edges in G with respect to the tree T

(B) There are no cross-edges in G with respect to the tree T

(C) There are no forward-edges in G with respect to the tree T

(D) The only edges in G are the edges in T

Q.11 Let A be any n × m matrix, where m > n. Which of the following statements is/are

TRUE about the system of linear equations Ax = 0?

(A) There exist at least m − n linearly independent solutions to this system

(B) There exist m − n linearly independent vectors such that every solution is a linear

combination of these vectors

(C) There exists a non-zero solution in which at least m − n variables are 0

(D) There exists a solution in which at least n variables are non-zero

Q.12 The chromatic number of a graph is the minimum number of colours used in a

proper colouring of the graph. Let G be any graph with n vertices and chromatic

number k. Which of the following statements is/are always TRUE?

(A) G contains a complete subgraph with k vertices

(B) G contains an independent set of size at least n/k

(C) G contains at least k(k − 1)/2 edges

(D) G contains a vertex of degree at least k

Q.13 Consider the operators ◊ and □ defined by a ◊ b = a + 2b, a□b = ab, for positive

integers. Which of the following statements is/are TRUE?

(A) Operator ◊ obeys the associative law

(B) Operator □ obeys the associative law

(C) Operator ◊ over the operator □ obeys the distributive law

(D) Operator □ over the operator ◊ obeys the distributive law

Q.14 The number of edges present in the forest generated by the DFS traversal of an

undirected graph G with 100 vertices is 40. The number of connected components

in G is \_\_\_\_\_\_\_\_\_

Q.15 A bag contains 10 red balls and 15 blue balls. Two balls are drawn randomly without replacement. Given that the first ball drawn is red, the probability (rounded off to 3 decimal places) that both balls drawn are red is \_\_\_\_\_\_\_\_\_