**Determinants and Cramer’s Rule**

**Choose the most appropriate option (a, b, c or d).**

Q 1. If then x is

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

Q 2. is equal to

(a) p + q + r (b) 0 (c) p – q – r (d) –p + q + r

Q 3. If a ≠ b ≠ c such that then

(a) ab + bc + ca = 0 (b) a + b + c = 0 (c) abc = 1 (d) a + b + c = 1

Q 4. is equal to

(a) x2(x + 3) (b) 3x3 (c) 0 (d) x3

Q 5. If then

(a) x = 3, y = 1 (b) x = 1, y = 3 (c) x = 0, y = 3 (d) x = 0, y = 0

Q 6. The determinant = 0 for all p ∈ R if

(a) x, y, z are in AP (b) x, y, z are in GP (c) x, y, z are in HP (d) xy, yz, zx are in AP

Q 7. The determinant . Then

(a) d = 0 (b) a + d = 0 (c) d = 0 or a + d = 0 (d) none of these

Q 8. The value of the determinant , where a, b, c are the pth, qth and rth terms of a HP, is

(a) ap + bq + cr (b) (a + b + c)(p + q + r) (c) 0 (d) none of these

Q 9. The sum of two nonintegral roots of is

(a) 5 (b) -5 (c) -18 (d) none of these

Q 10. If x, y, z are integers in AP, lying between 1 and 9, and x51, y41 and z31 are three-digit numbers then the value of is

(a) x + y + z (b) x – y + z (c) 0 (d) none of these

Q 11. If Δ1 = , Δ2 = then

(a) Δ1 + Δ2 = 0 (b) Δ1 + 2Δ2 = 0 (c) Δ1 = Δ2 (d) none of these

Q 12. Two nonzero distinct numbers a, b are used as elements to make determinants of the third order. The number of determinants whose value is zero for all a, b is

(a) 24 (b) 32 (c) a + b (d) none of these

Q 13. The value of is equal to

(a) x2 + y2 (b) 0 (c) a1a2a3x2 + b1b2b3y2 (d) none of these

Q 14. Ifthen the two triangles whose vertices are (x1, y1), (x2, y2), (x3, y3) and (a1, b1), (a2, b2), (a3, b3) are

(a) congruent (b) similar (c) equal in area (d) none of these

Q 15. If α, β are nonreal numbers satisfying x3 – 1 = 0 then the value of

is equal to

(a) 0 (b) λ3 (c) λ3 + 1 (d) none of these

Q 16. The value of is equal to zero when m is

(a) 6 (b) 4 (c) 5 (d) none of these

Q 17. If x > 0 and ≠ 1, y > 0 and ≠ 1, z > 0 and ≠ 1 then the value of

is

(a) 0 (b) 1 (c) -1 (d) none of these

Q 18. The value of is

(a) 0 (b) 30x (c) 30-x (d) none of these

Q 19. The value of the determinant is

(a) 0 (b) –(6!) (c) 80 (d) none of these

Q 20. has the value

(a) 0 (b) 1 (c) sinA sinB cos C (d) none of these

Q 21. The value of is

(a) 1 (b) -1 (c) 0 (d) – xyz

Q 22. If = i, and ω is a nonreal cube root of unity then the value of

is equal to

(a) 1 (b) i (c) ω (d) 0

Q 23. If then f(100) is equal to

(a) 0 (b) 1 (c) 100 (d) -100

Q 24. The value of , where , is

(a) 1 if m is a multiple of 4 (b) 0 for all real m

(c) –i if m is a multiple of 3 (d) none of these

Q 25. If Δ1 = , Δ2 = then Δ1 - Δ2 = 0 for

(a) x = 2 (b) all real x (c) x = 0 (d) none of these

Q 26. If Δ1 = , Δ2 = 

such that Δ1 + Δ2 = 0 then

(a) x = 5 (b) x has no real value (c) x = 0 (d) none of these

Q 27. Let = pλ4 + qλ3 + rλ2 + sλ + t

be an identity in λ, where p, q, r, s, t are independent of λ. Then the value of t is

(a) 4 (b) 0 (c) 1 (d) none of these

Q 28. Let = ax5 + bx4 + cx3 + dx2 + λx + μ

be an identity in x, where a, b, c, d, λ, μ are independent of x. Then the value of λ is

(a) 3 (b) 2 (c) 4 (d) none of these

Q 29. Using the factor theorem it is found that b + c, c + a and a + b are three factors of the determinant . The other factor in the value of the determinant is

(a) 4 (b) 2 (c) a + b + c (d) none of these

Q 30. If the determinant is expanded in powers of sin x then the constant term in the expansion is

(a) 1 (b) 2 (c) -1 (d) none of these

Q 31. If Δ(x) = is equal to

(a)  (b)  (c) 0 (d) −

Q 32. If and = α, β, γ, δ then is equal to

(a) i (b) –i (c) 1 (d) 0

Q 33. The roots of = 0 are independent of

(a) λ, μ, ν (b) a, b (c) λ, μ, ν, a, b (d) none of these

Q 34. The value of is

(a) 6! (b) 5! (c) 1.22 . 3. 43. 54. 64 (d) none of these

Q 35. If = square of a determinant Δ of the third order then Δ is equal to

(a)  (b)  (c)  (d) none of these

Q 36. The system of equation ax + 4y + z = 0, bx + 3y + z = 0, cx + 2y + z = 0 has nontrivial solutions if a, b, c are in

(a) AP (b) GP (c) HP (d) none of these

Q 37. If the equations a(y + z) = x, b(z + x) = y and c(x + y) = z, where a ≠ -1, b ≠ -1, c ≠ -1, admit of nontrivial solutions then

(1 + a)-1 + (1 + b)-1 + (1 + c)-1 is

(a) 2 (b) 1 (c)  (d) none of these

Q 38. The system of equations

2x − y + z = 0

x – 2y + z = 0

λx – y + 2z = 0

has infinite number of nontrivial solutions for

(a) λ = 1 (b) λ = 5 (c) λ = -5 (d) no real value of λ

Q 39. The equations x + y + z = 6, x + 2y + 3z = 10, x + 2y + mz = n give infinite number of values of the triplet (x, y, z) if

(a) m = 3, n ∈ R (b) m = 3, n ≠ 10 (c) m = 3, n = 10 (d) none of these

Q 40. The system of equations 2x + 3y = 8, 7x – 5y + 3 = 0, 4x – 6y + λ = 0 is

(a) 6 (b) 8 (c) -8 (d) -6

Q 41. If the system of equations

ax + by + c = 0

bx + cy + a = 0

cx + ay + b = 0

has a solution then the system of equations

(b + c)x + (c + a)y + (a + b)z = 0

(c + a)x + (a + b)y + (b + c)z = 0

(a + b)x + (b + c)y + (c + a)z = 0

has

(a) only one solution (b) no solution

(c) infinite number of solutions (d) none of these

**Choose the correct options. One or more options may be correct.**

Q 42. Let {Δ1, Δ2, Δ3,….., Δk} be the set of third order determinants that can be made with the distinct nonzero real numbers a1, a2, a3,…., a9. Then

(a) k = 9! (b)  (c) at least one ΔI = 0 (d) none of these

Q 43. is divisible by

(a) x2 + y2 + z2 (b) x – y (c) x – y – z (d) x + y + z

Q 44. The equation = 0 has

(a) exactly two distinct roots (b) one pair of equal real roots

(c) modulus of each root 1 (d) three pairs of equal roots

Q 45. Let f(n) = , where the symbols have their usual meanings. The f(n) is divisible by

(a) n2+ n + 1 (b) (n + 1)! (c) n! (d) none of these

Q 46. Let x ≠ -1 and let a, b, c be nonzero real numbers. Then the determinant is divisible by

(a) abcx (b) (1 + x)2 (c) (1 + x)3 (d) x(1 + x)2

Q 47. The arbitrary constant on which the value of the determinant



does not depend is

(a) α (b) p (c) d (d) a

Q 48. Let Δ(x) = and , where a, b, c, d are in AP, then the common difference of the AP is

(a) 1 (b) 2 (c) -2 (d) none of these

Q 49. If A + B + C = π, eiθ = cos θ + isin θ and then

(a) Re(z) = 4 (b) Im(z) = 0 (c) Re(z) = -4 (d) Im(z) = -1

Q 50. If = 0 then x is

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

Q 51. A value of c for which the system of equations

x + y = 1

(c + 2)x + (c + 4)y = 6

(c + 2)2x + (c + 4)2y = 36

(a) 1 (b) 2 (c) 4 (d) none of these

Q 52. Eliminating a, b, c from we get

(a)  (b)  (c)  (d) none of these

Q 53. The system of equations

6x + 5y + λz = 0

3x – y + 4z = 0

x + 2y – 3z = 0

has

(a) only a trivial solution for λ ∈ R

(b) exactly one nontrivial solution for some real λ

(c) infinite number of nontrivial solutions for one value of λ

(d) only one solution for λ ≠ -5

1a 2b 3c 4a 5d 6b 7c 8c 9b 10c

11a 12b 13b 14c 15b 16c 17a 18a 19b 20a

21c 22d 23a 24b 25b 26a 27b 28a 29a 30c

31d 32d 33b 34b 35a 36a 37a 38c 39c 40b

41c 42ab 43abd 44bcd 45ac 46abd 47b 48bc 49bc 50ac

51bc 52bc 53cd