1. If roots of the equation (a – b) x^2 + (c – a) x + (b – c) = 0 are equal, then a, b, c are in –
   A. A.P.
   B. H.P.
   C. G.P.
   D. None of these

2. If the roots of the equation a(b – c) x^2 + b (c – a) x + c (a – b) = 0 are equal, then a, b, c are in.
   A. HP
   B. GP
   C. AP
   D. None of these

3. If the ratio of sum of n terms of two A.P's is (3n + 8) : (7n + 15), then the ratio of 12^{th} terms is –
   A. 16 : 7
   B. 7 : 16
   C. 7 : 12
   D. 12 : 5

4. If the ratio of the sum of n terms of two AP's is 2n : (n + 1), then the ratio of their 8^{th} terms is –
   A. 15 : 8
   B. 8 : 13
   C. n : (n – 1)
   D. 5 : 17

5. The sum to infinity of the following series $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots$.. shall be –
   A. ∞
   B. 1
   C. 0
   D. None of these

6. $\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \cdots$ ….. upto ∞ term is –
   A. $\frac{1}{2}$
   B. 1
   C. $\frac{1}{3}$
   D. None

7. If A.M. between p and q ($p \geq q$) is two times the GM, then p : q is –
   A. 1 : 1
   B. 2 : 1
   C. $(2 + \sqrt{3}) : (2 - \sqrt{3})$
   D. 3 : 1

8. If the arithmetic mean of two numbers a, b ; a > b > 0 is five times their geometric mean, then $\frac{a+b}{a-b}$ is equal to –
   A. $\frac{7\sqrt{3}}{12}$
   B. $\frac{3\sqrt{2}}{4}$
   C. $\frac{\sqrt{6}}{2}$
   D. $\frac{5\sqrt{6}}{12}$

9. If S_n denotes the sum of n terms of an A.P., then $S_{n+3} - 3S_{n+2} + 3S_{n+1} - S_n$ is equal to –
   A. 0
   B. 1
   C. 1/2
   D. 2

10. Let T_r be te r^{th} term of an A.P. whose first term is a and common difference is d. If for some positive integers m, ≠ n, $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, then a – d equals –

A. 0
B. 1
C. 1/mn
D. $\frac{1}{m} + \frac{1}{n}$

11. 1.2.3 + 2.3.4 + 3.4.5 +………. + n terms –

A. $\frac{n(n+1)(n+2)(n+3)}{12}$
B. $\frac{n(n+1)(n+2)(n+3)}{3}$
C. $\frac{n(n+1)(n+2)(n+3)}{4}$
D. $\frac{(n+2)(n+3)(n+4)}{6}$

12. The sum of the first n terms of the series $1^2 + 2.\ 2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 +$ ….. $\frac{n(n+1)^2}{2}$ when n is even. When n is odd the sum is –

A. $\frac{3n(n+1)}{2}$
B. $\frac{n^2(n+1)}{2}$
C. $\frac{n(n+1)^2}{4}$
D. $\left[\frac{n(n+1)}{2}\right]^2$

13. Square root of 7 + 24i is –

A. $\pm(3 - 4i)$
B. $\pm(4 + 3i)$
C. $\pm(4 - 3i)$
D. $\pm(-3 - 4i)$

14. Square root of –5 – 2i is –

A. $\pm(-2-3i)$

B. $\pm(3-2i)$

C. $\pm(2-3i)$

D. $\pm(-3-2i)$

15. If $\left|z-\frac{1}{z}\right| = 1$, then:

A. $|z|_{max} = \frac{1+\sqrt{5}}{2}$

B. $|z|_{min} = \frac{1+\sqrt{5}}{2}$

C. $|z|_{max} = \frac{-1+\sqrt{5}}{2}$

D. None of these

16. If $c^2 + s^2 = 1$, then $\frac{1+c+is}{1+c-is} =$

A. c + is

B. s + ic

C. c – is

D. s – ic

17. If x = a + b, y = aω + bω^2, z=aω^2+bω, then xyz equals –

A. $(a+b)^3$

B. $a^3 - b^3$

C. $(a+b)^3$+ 3ab (a + b)

D. $a^3 + b^3$

18. The value of the expression $\left(1+\frac{1}{\omega}\right)\left(1+\frac{1}{\omega^2}\right)+\left(2+\frac{1}{\omega}\right)\left(2+\frac{1}{\omega^2}\right)+\left(3+\frac{1}{\omega}\right)\left(3+\frac{1}{\omega^2}\right)+\cdots+\left(n+\frac{1}{\omega}\right)\left(n+\frac{1}{\omega^2}\right)$, where ω is an imaginary cube root of unity is-

A. $\frac{n\,(n^2+3)}{3}$

B. $\frac{n\,(n^2+2)}{3}$

C. $\frac{n\,(n^2+1)}{3}$

D. None of these

19. If the coefficients of T_r, T_{r+1}, T_{r+2} terms of $(1+x)^{14}$ are in A.P., then r-
   A. 6
   B. 7
   C. 8
   D. 9

20. If in the expansion of $(1+y)^n$, the coefficient of 5^{th}, 6^{th} and 7^{th} terms are in A.P., then n is equal to –
   A. 7, 11
   B. 7, 14
   C. 8, 16
   D. 7, 15

21. If $(1+x)^n = C_0 + C_1x + C_2x^2 + \ldots + C_nx^n$. then $C_0 + 2C_1 + 3C_2 + \ldots + (n+1)\,C_n$ is equal to –
   A. $2^{n-1}(n+2)$
   B. $2^n(n+1)$
   C. $2^{n-1}(n+1)$
   D. $2^n(n+2)$

22. If $(1+x)^n = 1 + C_1x + C_2x^2 + \ldots + C_nx^n$, then $C_1 + C_3 + C_5 + \ldots$ is equal to –
   A. 2^n
   B. $2^n - 1$
   C. $2^n + 1$
   D. 2^{n-1}

23. If $C_0, C_1, C_2 \ldots\ldots C_n$ are binomial coefficients in the expansion of $(1+x)^n$, $n \epsilon N$, then $\frac{C_1}{2} + \frac{C_3}{4} + \frac{C_5}{6} + \cdots + \frac{C_n}{n+1}$ is equal to –
   A. $\frac{2^{n+1}-1}{n+1}$
   B. $(n+1).\,2^{n+1}$
   C. $\frac{2^n-1}{n+1}$
   D. $\frac{2^n-1}{n}$

24. If $(1+x)^n = C_0 + C_1x + C_2x^2 + \ldots + C_nx^n$, then $\frac{C_1}{C_0} + \frac{2C_2}{C_1} + \frac{3C_3}{C_2} + \cdots + \frac{nC_n}{C_{n-1}} =$

A. $\frac{n}{2}$

B. n (n + 1)

C. $\frac{n\,(n+1)}{12}$

D. $\frac{n\,(n+1)}{2}$

25. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix} = k \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$, then k is equal to-

A. 1

B. 2

C. 4

D. 0

26. value of determinant $\begin{vmatrix} (x-2)^2 & (x-1)^2 & x^2 \\ (x-1)^2 & x^2 & (x+1)^2 \\ x^2 & (x+1)^2 & (x+2)^2 \end{vmatrix}$ *is*

A. 0

B. $8x^2$

C. 8

D. – 8

27. If

$$\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & b+c & -2c \end{vmatrix} = \alpha(a+b)(b+c)(c+a) \neq 0, \text{then } \alpha \text{ is equal to}$$

A. 1

B. a + b + c

C. abc

D. 4

28. If a, b, c are sides of scalene triangle, then the value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ *is* :

A. Non – negative
B. negative
C. positive
D. non – positive

29. The value of determinant $\begin{vmatrix} x & x+a & x+2a \\ x+1 & x+2a & x+4a \\ x+2 & x+3a & x+6a \end{vmatrix}$ *is* :

A. 0
B. $a^3 - x^3$
C. $x^3 - a^3$
D. $(x-a)^3$

30. If a, b, c are non – zero real numbers, then $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$ is equal to

A. abc
B. $a^2b^2c^2$
C. $ab + bc + ca$
D. 0

31. $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta} =$

A. tan3θ
B. cot3θ
C. tan6θ
D. cot3θ

32. $\frac{\cos 3\theta + \cos 5\theta + \cos 7\theta}{\sin 3\theta + \sin 5\theta + \sin 7\theta} =$

A. cot5θ
B. $tan 15\theta$
C. tan5θ
D. cot3θ

33. $\cos 10^0 \cos 30^0 \cos 50^0 \cos 70^0 =$

A. $\frac{3}{16}$

B. $\frac{4}{5}$

C. $\frac{8}{15}$

D. $\frac{9}{12}$

34. The value of $6(\sin^6\theta + \cos^6\theta) - 9(\sin^4\theta + \cos^4\theta) +$ is :

A. – 3

B. 0

C. 1

D. 3

35. The value of $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta =$

A. 0

B. – 1

C. 1

D. 2

36. The value of $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) =$

A. 11

B. 12

C. 13

D. 14

37. The value of $\tan\alpha \cdot \tan(\alpha + 60°) + \tan\alpha \cdot \tan(\alpha - 60°) + \tan(\alpha + 60°)\tan(\alpha - 60°)$ is ?

A. 0

B. 3

C. – 3

D. 1

38. If A – B = $\frac{\pi}{4}$, then (1+ tanA) (1 −tanB) =

A. 1
B. 2
C. – 1
D. – 2

39. The value of $\sqrt{2+\sqrt{2+2cos4\theta}}$ (0° ≤ θ ≤ 15°) is equal to : -

A. sin θ
B. cos θ
C. 2 sin θ
D. 2 cos θ

40. In triangle ABC, (b + c) cos A + (c + a) cos B + (a + b) cos C =

(a) 0
(b) 1
(c) a + b + c
(d) 2(a + b +c)

41. In △ ABC, $a\sin(\mathrm{B}-\mathrm{C})+\ b\sin(\mathrm{C}-\mathrm{A})+\ c\sin(\mathrm{A}-\mathrm{B})=$

(a) 0
(b) $a+b+c$
(c) $a^2+b^2+c^2$
(d) $1(a^2+b^2+c^2)$

42. In a triangle ABC, $a^3\cos(\mathrm{B}-\mathrm{C})+b^3\cos(\mathrm{C}-\mathrm{A})+c^3\cos(\mathrm{A}-\mathrm{B})$

(a) abc
(b) 3abc
(c) a + b + c
(d) 0

43. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=\pi$, then $x^2+y^2+z^2\ 2xyz$

(a) 1

(b) -1
(c) 0
(d) 2

44. If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \frac{\pi}{2}$, then which of the following is true?
(a) $x + y + z + xyz = 0$
(b) $x + y + z = xyz$
(c) $xy + yz + zx + 1 = 0$
(d) $xy + yz + zx + 1 = 1$

45. Let $\sin^{-1}a + \sin^{-1}b + \sin^{-1}c = \pi$ then $a\sqrt{(1-a^2)} + b\sqrt{(1-b^2)} + c\sqrt{(1-c^2)} =$
(a) 2a b c
(b) a b c
(c) $\frac{1}{2}$ a b c
(d) $\frac{abc}{3}$

46. If $x^2 + y^2 + z^2 = k^2$, then value of $\tan^{-1}\left(\frac{xy}{zk}\right) + \tan^{-1}\left(\frac{xz}{yk}\right) + \tan^{-1}\left(\frac{zy}{xk}\right)$ is equal to?
(a) $\frac{\pi}{2}$
(b) π
(c) $\frac{3\pi}{2}$
(d) 0

47. The value of $\tan\left\{\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\left(\frac{x}{y}\right)\right\} + \tan\left\{\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\left(\frac{x}{y}\right)\right\}$ is equal to?
(a) $\frac{x}{y}$
(b) $\frac{y}{x}$
(c) $\frac{2x}{y}$
(d) $\frac{2y}{x}$

48. If $\cos^{-1}x - \cos^{-1}\frac{y}{2} = \alpha$, then $4x^2 - 4xy\cos\alpha + y^2$ is equal to:

(a) $4\sin^2\alpha$

(b) $-4\sin^2\alpha$

(c) $2\sin 2\alpha$

(d) 4

49. The value of $2\tan^{-1}\left(\sqrt{\frac{a-b}{a+b}}\tan\frac{\theta}{2}\right)$ is:

(a) $\cos^{-1}\left(\frac{a\cos\theta+b}{a+b\cos\theta}\right)$

(b) $\cos^{-1}\left(\frac{a\cos\theta}{a\cos\theta+b}\right)$

(c) $\cos^{-1}\left(\frac{a\cos\theta}{a+b\cos\theta}\right)$

(d) $\cos^{-1}\left(\frac{b\cos\theta}{a\cos\theta+b}\right)$

50. If the point $(3,-1)$ divides the line between the x-axis and y-axis in the ratio 2:3 then the equation of the line will be-

(a) $2x + y = 10$

(b) $2x - y = 10$

(c) $x + 2y = 10$

(d) $x - 2y = 10$

51. If the point (5, 2) bisects the intercept of a line between the axes, then its equation is-

(a) $5x + 2y = 20$

(b) $2x + 5y = 20$

(c) $5x - 2y = 20$

(d) $2x - 5y = 20$

52. The foot of perpendicular from the point (3, 4) on the line $3x - 4y + 5 = 0$ is-

(a) $\left(\frac{81}{25}, \frac{92}{25}\right)$

(b) $\left(\frac{92}{25}, \frac{81}{25}\right)$

(c) $\left(\frac{46}{25}, \frac{54}{25}\right)$

(d) $\left(\frac{-81}{25}, \frac{92}{25}\right)$

53. The reflection of the point (4, -13) in the line $5x + y + 6 = 0$ is

(a) $(-1, -14)$

(b) (3, 4)

(c) (1, 2)

(d) (-4, 13)

54. The length of the latus-rectum of the parabola $x^2 - 4x - 8y + 12 = 0$ is

(a) 4

(b) 6

(c) 8

(d) 10

55. Find the latus-rectum of the parabola $3x^2 - 6x - y + 6 = 0$ is

(a) $\frac{1}{3}$

(b) $\frac{1}{5}$

(c) $\frac{2}{3}$

(d) $\frac{2}{7}$

56. The axis of the arable $4y^2 - 6x - 4y = 5$ is

(a) $y - 1 = 0$

(b) $2y + 1 = 0$

(c) $2y - 1 = 0$

(d) $y - 2 = 0$

57. Find the axis of the parabola $3x^2 - 6x - y + 6 = 0$ is

(a) $x - 2 = 0$

(b) $x - 1 = 0$

(c) $x + 1 = 0$

(d) $2x - 1 = 0$

58. The equation $ax^2 + by^2 + cx + dy + e = 0$

(a) $\frac{1}{\sqrt{3}}$

(b) $\frac{1}{2}$

(c) $\frac{\sqrt{3}}{2}$

(d) $\frac{2}{\sqrt{3}}$

59. Eccentricity of the ellipse $4x^2 + y^2 - 8x + 2y + 1 = 0$ is:

(a) $\frac{1}{\sqrt{3}}$

(b) $\frac{\sqrt{3}}{2}$

(c) $\frac{1}{2}$

(d) $\frac{1}{4}$

60. The eccentricity of the ellipse represented by the equation $25x^2 + 16y^2 - 150x - 175 = 0$ is:

(a) 2/5

(b) 3/5

(c) 4/5

(d) 7/5

61. Latus rectum of ellipse $4x^2 + 9y^2 - 8x - 36y + 4 = 0$ is:

(a) 8/3

(b) 4/3

(c) $\frac{\sqrt{5}}{3}$

(d) 16/3

62. The length of the latus rectum of ellipse $9x^2 + 16y^2 - 36x + 96y + 36 = 0$

(a) $\frac{9}{2}$

(b) $\frac{7}{2}$

(c) $\frac{2}{3}$

(d) $\frac{5}{4}$

63. The equation $16x^2 - 3y^2 - 32x + 12y - 44 = 0$ represents a hyperbola, then its eccentricity is

(a) $\frac{16}{3}$

(b) $\frac{4}{\sqrt{3}}$

(c) $\sqrt{3}$

(d) $\sqrt{\frac{19}{3}}$

64. The eccentricity of the hyperbola $9x^2 - 4y^2 + 18x - 8y - 31 = 0$ is:

(a) $\sqrt{\frac{11}{2}}$

(b) $\sqrt{\frac{13}{4}}$

(c) $\sqrt{\frac{7}{4}}$

(d) $\sqrt{\frac{9}{2}}$

65. The eccentricity of $x^2 - 3y^2 - 4x - 6y - 11 = 0$ is-

(a) $\frac{2}{\sqrt{5}}$

(b) $\frac{5}{\sqrt{3}}$

(c) $\frac{2}{\sqrt{3}}$

(d) $\frac{1}{\sqrt{2}}$

66. For any vector $\vec{a}, |\vec{a} \times \hat{\imath}|^2 + |\vec{a} \times \hat{\jmath}|^2 + |\vec{a} \times \hat{k}|^2$ is equal to-

(a) $|\vec{a}|^2$

(b) $2|\vec{a}|^2$

(c) $3|\vec{a}|^2$

(d) $4|\vec{a}|^2$

67. $[(\vec{a}\times\vec{b})\times(\vec{b}\times\vec{c})\ \ (\vec{b}\times\vec{c})\times(\vec{c}\times\vec{a})\ \ (\vec{c}\times\vec{a})\times(\vec{a}\times\vec{b})]$; (where $\vec{a},\vec{b}$ and $\vec{c}$ are non zero non-coplanar vector) is equal to
(a) $[\vec{a}\ \vec{a}\ \vec{a}]^2$
(b) $[\vec{a}\ \vec{b}\ \vec{c}]^3$
(c) $[\vec{a}\ \vec{b}\ \vec{c}]^4$
(d) $[\vec{a}\ \vec{b}\ \vec{c}]$

68. $\lim_{n\to\infty}\left(\frac{1}{n^2}+\frac{2}{n^2}+\frac{3}{n^2}+\cdots+\frac{n}{n^2}\right)$ equals-
(a) 0
(b) ½
(c) 2n
(d) 2^n

69. $\lim_{n\to\infty}\left(\frac{1}{2.3}+\frac{1}{3.4}+\cdots+\frac{1}{n(n+1)}\right)$equals –
(a) 1/12
(b) 2/7
(c) 5/8
(d) 1/11

70. $\lim_{n\to 0}\left(\frac{a_1^x+a_2^x+a_3^x+a_4^x}{n}\right)^{\frac{1}{x}}=(a_1\,a_2a_3\ldots a_n)^{\frac{1}{n}}$
(a) $(n!)^n$
(b) $(n!)^{1/n}$
(c) n!
(d) $\ell n(n!)$

71. $\lim_{n\to 0}\left(\frac{a^x+b^x+c^x}{3}\right)^{\frac{1}{x}}$
(a) $(abc)^{\frac{1}{3}}$
(b) $(abc)^{\frac{1}{2}}$

(c) $(abc)^{\frac{1}{5}}$

(d) $(4abc)^{\frac{2}{3}}$

72. If $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$, then $\frac{dy}{dx}$ is equal to-

(a) $\sqrt{1-x^2}+\sqrt{1-y^2}$

(b) $\sqrt{\frac{1-y^2}{1-x^2}}$

(c) $\sqrt{\frac{1-x^2}{1-y^2}}$

(d) $\sqrt{\frac{1+y^2}{1+x^2}}$

73. If $\sqrt{1-x^6}+\sqrt{1-y^6}=a^3(x^3-y^3)$, then $\frac{dy}{dx}$ is equal to-

(a) $\sqrt{\frac{1-y^6}{1-x^6}}.\frac{x^3}{y^3}$

(b) $\sqrt{\frac{1-y^6}{1-x^6}}.\frac{x^2}{y^2}$

(c) $\sqrt{\frac{1+y^6}{1+x^6}}.\frac{x^3}{y^3}$

(d) $\sqrt{\frac{1+y^6}{1+x^6}}.\frac{y^2}{x^2}$