PS

LEVEL-I

1. n^{th} term of 5, 3, 1, –1, –3, –5, ……… is
(A) 2n – 7 (B) 7 – 2n (C) 2n + 3 (D) 2n + 5

2. n^{th} term of 1, $\frac{1}{2}$, $\frac{1}{3}$, …. is
(A) $\frac{1}{n-1}$ (B) $\frac{1}{n+1}$ (C) $\frac{1}{n}$ (D) $\frac{n}{n-1}$

3. Sum of the series $\frac{1}{2} + \frac{1}{2\sqrt{2}} + \frac{1}{4} + \ldots\ldots\ldots \infty$ is
(A) $1 + \frac{1}{\sqrt{2}}$ (B) 1 (C) $\frac{1}{\sqrt{2}-1}$ (D) $\frac{\sqrt{2}}{\sqrt{2}-1}$

4. Number of integers between 100 and 200, that are divisible by 5 are
(A) 10 (B) 20 (C) 9 (D) 19

5. H.M of 3 and $\frac{1}{3}$ is
(A) $\frac{5}{3}$ (B) 1 (C) $\frac{20}{3}$ (D) $\frac{3}{5}$

6. The n^{th} terms of the two series 3 + 10 + 17 + …. and 63 + 65 + 67 + …… are equal, then the value of n is
(A) 9 (B) 13
(C) 19 (D) none of these

7. If n A.M's are inserted between two quantities a and b, then their sum is equal to
(A) n(a + b) (B) $\frac{n}{2}$(a + b)
(C) 2n(a + b) (D) $\frac{n}{2}$(a – b)

8. If a, b, c are in H.P, then the value of $\frac{b+a}{b-a} + \frac{b+c}{b-c}$ is
(A) 1 (B) 2
(C) 3 (D) none of these

9. If a, b, c are in A.P., a, x, b are in G.P. and b, y, c are in G.P., then x^2, b^2, y^2 are in
(A) H.P (B) G.P
(C) A.P (D) none of these

10. If a, b, c, d, e are in A.P, then (e – a) is equal to
(A) 2(b + d) (B) 2(b – d) (C) 2(d – b) (D) none of these

11. If (2x – 1), (4x – 1), (7 + 2x) ……. are in G.P, then next term of the sequence is
(A) 625/3 (B) 125/3 (C) 81 (D) 9

12. In any triangle ABC the angles A, B, C are in A.P, then the value of sin 2B is given by
(A) 1/2 (B) $\sqrt{3}$/2 (C) 1/$\sqrt{2}$ (D) none of these

13. If $1 + 2 + 3 + \ldots\ldots. + 49 = x$, then $1^3 + 2^3 + 3^3 + \ldots\ldots + 49^3$ is given by
(A) x^3 (B) x^2 (C) $x^2 + x$ (D) none of these

14. If a, b, c are in A.P and a, b, d are in G.P, then a, a – b, d – c will be in
(A) A.P (B) G.P (C) H.P (D) none of these

15. rth term of sequence $\frac{1}{1\cdot 3\cdot 5}+\frac{1}{3\cdot 5\cdot 7}+\frac{1}{5\cdot 7\cdot 9}+.......$ is given by
(A) $\frac{1}{r(r+2)(r+4)}$ (B) $\frac{1}{(2r+1)(2r+3)(2r+5)}$ (C) $\frac{1}{(2r-1)(2r+1)(2r+3)}$ (D) none of these

16. If $v_r = \frac{1}{1+(r-1)r}$, then v_{r-1} is equal to
(A) $\frac{1}{1+(r+1)r}$ (B) $\frac{1}{1+(r-1)r}$ (C) $\frac{1}{1+(r-1)(r-2)}$ (D) none of these

17. The value of $\log x+\log\left(1+\frac{1}{x}\right)+\log\left(1+\frac{1}{1+x}\right)+\log\left(1+\frac{1}{2+x}\right)+........+\log\left(1+\frac{1}{(n-1+x)}\right)$
(A) $\log\frac{x}{n}$ (B) $\log nx$ (C) $\log(n+x)$ (D) $\log(n-1)x$

18. If a, b, c, d are in H.P., then ab + bc + c d is equal to………

19. If the first term of a G.P is 1 and the sum of the third and fifth terms is 90. Then the common ratio if G.P is
(A) ± 1 (B) ± 2
(C) ± 3 (D) ± 4

20. If a, b, c are in A.P., then $\frac{1}{bc},\frac{1}{ca},\frac{1}{ab}$ will be in
(A) A.P. (B) G.P.
(C) H.P. (D) None of these

21. The numbers 1, 4, 16 can be three terms (not necessarily consecutive) of
(A) no A.P. (B) only 1 or 2 G.Ps
(C) infinite number of A.Ps (D) infinite number of G.Ps

22. If $S_n = \sum_{r=1}^{n}\frac{1+2+2^2.....r\ \text{terms}}{2^r}$, then S_n is equal to
(A) $2^n - (n + 1)$ (B) $n \times (n + 1)/2$
(C) $(n^2 + 3n + 2)/6$ (D) $n - 1 + (1/2^n)$

23. If $S_n = nP + \frac{n(n-1)}{2}Q$, where S_n denotes the sum of the first ‘n’ terms of an A.P. then the common difference is
(A) P + Q (B) 2P + 3Q
(C) 2Q (d) Q

24. a, b, c $\in R^+$ and from an A.P. if abc = 4, then the minimum value of b is
(A) $(2)^{2/3}$ (B) $(2)^{1/3}$
(C) $(4)^{2/3}$ (D) none of these

25. If b + c, c + a, a + b are in H.P., then a^2, b^2, c^2 will be in
(A) G.P.
(B) H.P.
(C) A.P.
(D) none of these

26. Every term of a G.P. is positive and every term is the sum of two preceding terms. Then the common ratio of the G.P. is
(A) $\frac{1-\sqrt{5}}{2}$
(B) $\frac{1+\sqrt{5}}{2}$
(C) $\frac{\sqrt{5}-1}{2}$
(D) 1

27. 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) A.P.
(B).G.P.
(C) H.P.
(D) none of these

28. If a, b, c $\in R^+$, then $\frac{bc}{b+c}+\frac{ac}{a+c}+\frac{ab}{a+b}$ is always
(A) $\leq \frac{1}{2}(a+b+c)$
(B) $\geq \frac{1}{3}\sqrt{abc}$
(C) $\leq \frac{1}{3}(a+b+c)$
(D) $\geq \frac{1}{2}\sqrt{abc}$

29. If a, b, c are in A.P., then $a^3 + c^3 - 8b^3$ is equal to
(A) 2abc
(B) 6abc
(C) 4abc
(D) none of these

30. If $\frac{1}{a}+\frac{1}{a-b}+\frac{1}{c}+\frac{1}{c-b} = 0$ and $a + c - b \neq 0$, then a, b, c are in
(A) A.P.
(B) G.P.
(C) H.P.
(D) none of these

31. Three non-zero numbers a, b and c are in A.P.. Increasing a by 1 or increasing c by 2 the number become in G.P., then 'b' equals to
(A) 10
(B) 12
(C) 14
(D) 16

32. Let the positive numbers a, b, c, d be in A.P. then abc, abd, acd, bcd are
(A) not in A.P./G.P./H.P.
(B) in A.P.
(C) in G.P.
(D) in H.P.

33. Consider an infinite series with first term a and common ratio 'r'. If its sum is 4 and the second term is $\frac{3}{4}$, then
(A) $a = \frac{7}{4}$, $t = \frac{3}{7}$
(B) $a = 2$, $r = \frac{3}{8}$
(C) $a = \frac{3}{2}$, $r = \frac{1}{2}$
(D) $a = 3$, $r = \frac{1}{4}$

34. The value of $\sum_{r=1}^{n}\log\left(\frac{a^r}{b^{r-1}}\right)$ is
(A) $\frac{n}{2}\log\left(\frac{a^n}{b^n}\right)$
(B) $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^n}\right)$

(C) $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^{n+1}}\right)$

(D) $\frac{n}{2}\log\left(\frac{a^{n+1}}{b^{n-1}}\right)$

LEVEL-II

1. If a, b, c are in H.P. and $a > c > 0$, then $\frac{1}{b-c} - \frac{1}{a-b}$
(A) is positive (B) is zero (C) is negative (D) has no fixed sign.

2. If the sum S_n of n terms of a progression is a cubic polynomial in n, then the progression whose sum of n terms is $S_n - S_{n-1}$ is
(A) an A. P. (B) a G. P. (C) a H.P. (D) an A. G. P.

3. Let $p, q, r \in R^+$ and $27pqr \ge (p + q + r)^3$ and $3p + 4q + 5r = 12$ then $p^3 + q^4 + r^5$ is equal to
(A) 3 (B) 6 (C) 2 (D) none of these

4. Let a, b and c be positive real numbers such that $a + b + c = 6$. Then range of ab^2c^3 is
(A) $(0, \infty)$ (B) $(0, 1)$ (C) $(0, 108]$ (D) $(6, 108]$

5. $\log_4 5$, $\log_{20} 5$, $\log_{100} 5$ are in
(A) A.P. (B) G.P. (C) H.P. (D) none of these

6. If the product of three positive real numbers say a, b, c be 27, then the minimum value of $ab + bc + ca$ is equal to
(A) 27^4 (B) 27^3 (C) 27^2 (D) 27

7. If three distinct real numbers a, b, c are in G.P and $a + b + c = ax$, then
(A) $x \in \left[\frac{3}{4}, \infty\right) - \{1, 3\}$ (B) $x \in R^+$ (C) $x \in (-1, \infty)$ (D) none of these

8. If $\frac{1}{\sqrt{b}+\sqrt{c}}, \frac{1}{\sqrt{c}+\sqrt{a}}, \frac{1}{\sqrt{a}+\sqrt{b}}$ are in A.P. then $9^{ax+1}, 9^{bx+1}, 9^{cx+1}$, $x \ne 0$ are in
(A) G.P. (B) G.P. only if $x < 0$ (C) G.P. only if $x > 0$ (D) none of these

9. The sum of an infinitely decreasing G.P. is equal to 4 and the sum of the cubes of its terms is equal to 64/7. Then 5th term of the progression is
(A) $\frac{1}{4}$ (B) $\frac{1}{8}$ (C) $\frac{1}{16}$ (D) $\frac{1}{32}$

10. Number of increasing geometrical progression(s) with first term unity, such that any three consecutive terms, on doubling the middle become in A.P. is
(A) 0 (B) 1 (C) 2 (D) infinity

11. Sum of n terms of a sequence be $n^2 + 2n$, then it is
(A) AP (B) GP (C) HP (D) none of these

12. Sum of $\left(x + \frac{1}{x}\right) + \left(x^2 + \frac{1}{x^2}\right) + \left(x^3 + \frac{1}{x^3}\right) + \ldots\ldots\ldots \infty$ is
(A) –1 (B) $\frac{x+1}{1-x}$ (C) 0 (D) none of these

13. The third term of a G.P is 4. The product of first five terms is
(A) 4^3 (B) 4^5
(C) 4^4 (D) none of these

14. The sum of n terms of the series $1^2 - 2^2 + 3^2 - 4^2 + \ldots\ldots$ is, where n is even number

(A) $-\frac{n(n+1)}{2}$ (B) $\frac{n(n+1)}{2}$
(C) –n(n + 1) (D) none of these

15. After inserting n A.M's between 2 and 38, the sum of the resulting progression is 200. The value of n is
(A) 10 (B) 8
(C) 9 (D) none of these

16. If the numbers a, b, c, d, e form an A.P., then the value of a – 4b + 6c – 4d + e is
(A) 1 (B) 2
(C) 0 (D) none of these

17. If $S_1 = \{1\}$, $S_2 = \{2, 3\}$, $S_3 = \{4, 5, 6\}$, $S_4 = \{7, 8, 9, 10\}$, then first term of S_{20} is given by
(A) 20 (B) 190 (C) 191 (D) none of these

18. The polygon has 25 sides, the length of which starting from the smallest sides are in A.P. If perimeter is 2100 cm and length of largest side is 20 times that of the smallest side then the length of smallest side and common difference of A.P is
(A) 6, $6\frac{1}{3}$ (B) 8, $6\frac{1}{3}$ (C) 8, $5\frac{1}{3}$ (D) none of these

19. The fourth term of a G.P is 8, the product of the first seven terms is
(A) 2^{19} (B) 2^{20} (C) 2^{21} (D) 2^{24}

20. If 3x+7y + 4z = 21, where x, y, z are positive real numbers, then maximum value of $x^4y^5z^3$ is equal to
(A) $\frac{7^7 \times 5^5 \times 4^{-10}}{12}$ (B) $\frac{7^7 \times 5^5 \times 4^{10}}{12}$ (C) $\frac{7^6 \times 5^7}{4^{11} \times 3}$ (D) $\frac{7^5 \times 5^6}{4^{10} \times 3}$

21. If A, G and H be the A.M, G.M and H.M respectively of two distinct positive integers, then the equation $Ax^2 - |G|x - H = 0$ has
(A) both roots as fractions (B) at least one root as a negative fraction
(C) exactly one positive root (D) at least one root as integer

22. If a_1, a_2, a_3, ………a_n are in H.P, then $\frac{a_1}{a_2+a_3+...+a_n}, \frac{a_2}{a_1+a_3+...+a_n},...\frac{a_n}{a_1+a_2+...+a_{n-1}}$ are in
(A) A.P (B) G.P
(C) H.P (D) A.G.P

23. The tenth common term between the series 3 + 7 + 11 + ….. and 1 + 6 + 11 + …. is
(A) 191 (B) 193
(C) 211 (D) none of these

24. $\frac{3}{1^2} + \frac{5}{1^2+2^3} + \frac{7}{1^2+2^3+3^3} + ...$ to ∞ is
(A) 3 (B) 4 (B) 5 (D) 6

25. The number of divisors of 1029, 1859 and 122 are in
(A) A.P (B) G.P
(C) H.P (D) none of these

26. If the first two terms of a H.P. are $\frac{3}{5}$ and $\frac{9}{10}$ respectively then the largest term of H.P. is

(A) 2^{nd} term (B) 3^{rd} term
(C) 4^{th} term (D) none of these

27. If $\log_{10}x + \log_{10} y \geq 2$ then the smallest possible value of $x^2 + y^2$ is
(A) 200 (B) 2000
(C) 100 (D) none of these

28. If $ab = 4a + 9b$, $a > 0$, $b > 0$ then minimum value of $\sqrt{ab}$ is
(A) 13 (B) 14
(C) 12 (D) none of these

29. If $ax^3 + bx^2 + cx + d$ is divisible by $ax^2 + c$, then d is equal to
(A) $\frac{ab}{2}$ (B) $\frac{bc}{a}$
(C) $\frac{ac}{b}$ (D) none of these

30. The sum of the products of the nine numbers $\pm 1, \pm 2, \pm 3, \pm 4, 5$ taking two at a time is
(A) 155 (B) 30
(C) –30 (D) none of these

31. If in a series $t_n = \frac{n+1}{(n+2)!}$ then $\sum_{n=0}^{10} t_n$ is equal to
(A) $1-\frac{1}{10!}$ (B) $1-\frac{1}{11!}$
(C) $1-\frac{1}{12!}$ (D) none of these

32. The value of $\sum_{r=2}^{n} (r-n-2)^3$ is equal to
(A) $\frac{n^2(n+1)^2}{4}-9$ (B) $\frac{n^2(2n+1)(n+1)}{6}-9$
(C) $\frac{(n+1)\,n(n+1)^2}{4}-9$ (D) none of these

33. The harmonic means of the roots of equation $\left(5+\sqrt{2}\right)x^2-\left(4+\sqrt{5}\right)x+8+2\sqrt{5}=0$ is
(A) 2 (B) 4
(C) 6 (D) 8

34. If $x^2 + 9y^2 + 25z^2 = 15yz + 5xz + 3xy$ then x, y, z are in
(A) A.P. (B) G.P.
(C) H.P. (D) none of these

35. If $x_1^2 + x_2^2 + x_3^2 + \ldots + x_{50}^2 = 50$ and $\frac{1}{x_1^2 x_2^2 x_3^2 \ldots\ldots x_{50}^2} = A$ then
(A) $A_{minimum} = 1$ (B) $A_{maximum} = 1$
(C) $A_{minimum} = 50$ (D) $A_{maximum} = 50$

36. If *n* is an odd integer greater than or equal to 1 then the value of
$n^3-(n-1)^3+(n-2)^3-\ldots\ldots\ldots\ldots+(-1)^{n-1}1^3$ is

(A) $\frac{(n+1)^2(2n-1)}{4}$ (B) $\frac{(n-1)^2(2n-1)}{4}$

(C) $\frac{(n+1)^2(2n+1)}{4}$ (D) None of these

37. A monkey while trying to reach the top of a pole of height 12 meters takes every time a jump of 2 meters but slips 1metre while holding the pole. The number of jumps required to reach the top of the pole is .
(A) 6 (B) 10 (C) 11 (D) 12

38. The sum of n terms of the series $1^2 + 2.2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 + ...$ is $\frac{n(n+1)^2}{2}$ when n is even. When n is odd, the sum is
(A) $\frac{n^2(n+1)}{2}$ (B) $\frac{n(n^2-1)}{2}$
(C) $n(n+1)^2(2n+1)$ (D) None of these.

39. If $1.3 + 2.3^2 + 3.3^3 + ... + n.3^n = \frac{(2n-1)3^a + b}{4}$ then (a,b) is :
(A) (n –2, 3) (B) $(n-1,3)$ (C) $(n,3)$ (D) $(n+1,3)$

40. The sum of infinite series $\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + ...\infty$ is
(A) $\frac{1}{3}$ (B) 3 (C) $\frac{1}{4}$ (D) ∞

41. If a,b,c,d are positive real numbers such that $a+b+c+d=2$, then M= $(a+b)(c+d)$ satisfies the relation
(A) $0 \le M \le 1$ (B) $1 \le M \le 2$ (C) $2 \le M \le 3$ (D) $3 \le M \le 4$

42. If A.M. and G.M. between two numbers be A and G respectively, then the numbers are
(A) $A \pm \sqrt{A^2 - G^2}$ (B) $G \pm \sqrt{A^2 - G^2}$
(C) $A \pm \sqrt{G^2 - A^2}$ (D) None of these

43. The H.M. of two numbers is 4 and their A.M. and G.M. satisfy the relation $2A + G^2 = 27$, then the numbers are :
(a) –3,1 (b) 5, –25 (c) 5, 4 (d) 3, 6

44. If $\sum n$ = 55 then $\sum n^2$ is equal to
(a) 385 (b) 506 (c) 1185 (d) 3025

45. If $<a_n>$ is an A.P. and $a_1 + a_4 + a_7 + \ldots + a_{16} = 147$, then $a_1 + a_6 + a_{11} + a_{16} =$
(a) 96 (b) 98 (c) 100 (d) none of these

46. The interval for which the series $1 + (x-1) + (x-1)^2 + ...\infty$ may be summed, is
(a) $(0,1)$ (b) $(0,2)$ (c) $(-1,1)$ (d) $(-2,2)$

47. The interior angles of a polygon are in A.P. the smallest angle is 120° and The common difference is 5°. Then, the number of sides of polygon is :
(a) 5 (b) 7 (c) 9 (d) 15

48. $\log_{\sqrt{3}} x + \log_{\sqrt[4]{3}} x + \log_{\sqrt[6]{3}} x + ... + \log_{\sqrt[16]{3}} x = 36$ is

(a) $x = 3$ (b) $x = 4\sqrt{3}$ (c) $x = 9$ (d) $x = \sqrt{3}$

49. If $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ be the geometric mean between two distinct positive reals a and b, then the value of n is

(A) 0 (B) 1/2
(C) –1/2 (D) 1

50. If log 2, log $(2^x - 1)$ and log $(2^x + 3)$ are in A.P then x is equal to

(A) 5/2 (B) $\log_2 5$
(C) $\log_3 2$ (D) 3/2

51. The values of x for which $\frac{1}{1+\sqrt{x}}, \frac{1}{1-x}, \frac{1}{1-\sqrt{x}}$ are in A.P lies in

(A) (0, 2) (B) (1, ∞)
(C) (0, ∞) (D) none of these

52. If three positive real numbers a, b, c (c > a) are in H.P. then log [(a + c) (a + c –2b)] is equal to

(A) 2 log (c –b) (B) 2 log (a + c)
(C) 2 log (c –a) (D) log (abc)

53. The value of the expression $1.(2 - \omega)(2 - \omega^2) + 2.(3 - \omega)(3 - \omega^2) + \ldots\ldots\ldots + (n - 1).(n - \omega)(n - \omega^2)$, where ω is an imaginary cube root of unity is…………………………………………

54. Co-efficient of x^{99} in the polynomial (x –1) (x –2) (x –3)………… (x –100) is ……………………………..

55. The sum of first n terms of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16}$ + ……….is equal to …………………………….

56. $\log_3 2, \log_6 2, \log_{12} 2$, are in ………………………………………………………

57. If an A.P, the pth term is q and the (p + q)th term is 0. the qth term is

(A) –p (B) p
(C) p + q (D) p –q

58. If the sum of the series $1 + \frac{2}{x} + \frac{4}{x^2} + \frac{8}{x^3} + ...$ to ∞ is a finite number then

(A) x < 2 (B) $x > \frac{1}{2}$
(C) x > –2 (D) x < –2 or x > 2

59. If a > 1, b > 1 then the minimum value of $\log_b a + \log_a b$ is

(A) 0 (B) 1
(C) 2 (D) none of these

60. The product of n positive numbers is 1. Their sum is

(A) a positive integer
(B) divisible by n
(C) equal to n + $\frac{1}{n}$
(D) greater than or equal to n

61. If (1 + x) (1 + x^2) (1 + x^4) ………..(1 + x^{128}) = $\sum_{r=0}^{n} x^r$ then n is
(A) 255
(B) 127
(C) 63
(D) none of these

62. If t_n denotes the nth term of the series 2 + 3 + 6 + 11 + 18 + …..then t_{50} is
(A) $49^2 - 1$
(B) 49^2
(C) $50^2 + 1$
(D) $49^2 + 2$

63. Let t_n = n (n!). Then $\sum_{n=1}^{15} t_n$ is equal to
(A) 15! –1
(B) 15! +1
(C) 16! –1
(D) none of these

64. The sum of 19 terms of an A.P, whose n^{th} terms is 2n + 1 is
(A) 390
(B) 399
(C) 499
(D) none of these

65. Three numbers whose sum is 15 are in A.P, if 8, 6 and 4 be added to then respectively then these are in G.P, then the numbers are
(A) 4, 6, 8
(B) 1, 5, 9
(C) 2, 5, 8
(D) 3, 5, 7

66. If x + y + z = 3, then $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is , x , y, z > 0
(A) ≤ 3
(B) ≥ 3
(C) 4
(D) none of these

67. If x = $\log_5^3 + \log_7^5 + \log_9^7$ then
(A) x ≥ 3/2
(B) x ≥ $\frac{1}{\sqrt[3]{2}}$
(C) x > $\frac{3}{\sqrt[3]{2}}$
(D) none of these

68. If $t_r = 2^{r/2} + 2^{-r/2}$ then $\sum_{r=1}^{10} t_r^2$ is equal to
(A) $\frac{2^{21}-1}{2^{10}} + 20$
(B) $\frac{2^{21}-1}{2^{10}} + 19$
(C) $\frac{2^{21}-1}{2^{20}} - 1$
(D) $3 \times \frac{2^{10}-1}{2^{10}} + 20$

69. If (a, b), (c, d), (e, f) are the vertices of a triangle such that a, c, e are in G.P. with common ratio r and b, d, f are in G.P. with common ratio s then the area of the triangle is
(A) $\frac{ab}{2}(r+1)(s+2)(s+r)$
(B) $\frac{ab}{2}(r-1)(s+1)(s-r)$
(C) $\frac{ab}{2}(r-1)(s-1)(s-r)$
(D) $\frac{ab}{2}(r+1)(s+1)(s-r)$

70. $a, b, c \in R^+$, then the minimum value of $a(b^2 + c^2) + b(c^2 + a^2) + c(a^2 + b^2)$ is equal to
(A) abc
(B) 2abc
(C) 3abc
(D) none of these

71. $a, b, c \in R^+ \sim \{1\}$ and $\log_a 100$, $2\log_b 10$, $2\log_c 5 + \log_c 4$ are in H.P., then
(A) $2b = a + c$
(B) $b^2 = ac$
(C) $b(a + c) = 2ac$
(D) none of these

72. If (m + 1)th , (n + 1)th and (r + 1)th terms of an A.P. are in G.P. and m, n, r in H.P., then ratio of the first term of the A.P. to its common difference in terms of n is
(A) $\frac{n}{2}$
(B) $-\frac{n}{2}$
(C) $\frac{n}{3}$
(D) $-\frac{n}{3}$

73. Suppose a, b, c are in A.P. and a^2, b^2, c^2 are in G.P.. If $a < b < c$ and $a + b + c = \frac{3}{2}$, then the value of a is
(A) $\frac{1}{2\sqrt{2}}$
(B) $\frac{1}{2\sqrt{3}}$
(C) , $\frac{1}{2} - \frac{1}{3}$
(D) $\frac{1}{2} - \frac{1}{\sqrt{2}}$

74. The value of $2^{1/4}.4^{1/8}.8^{1/16}\ldots\ldots \infty$ is
(A) 1
(B) 2
(C) $\frac{3}{2}$
(D) $\frac{5}{2}$

75. Coefficient of x^9 in the polynomial $(x – 5)(x – 8)(x – 11)\ldots.(x – 32)$ is given by
(A) 185
(B) 153
(C) –185
(D) –153

LEVEL-III

1. $\sum_{n=1}^{\infty}\frac{n}{4n^4+1}$ equals to
(A) 0 (B) 1 (C) ∞ (D) none of these .

2. If $3x^2 - 2(a - d)x + (a^2 + 2(b^2 + c^2) + d^2) = 2(ab + bc + cd)$, then
(A) a, b, c, d are in G .P. (B) a, b, c, d are in H .P.
(C) a, b, c, d are in A .P. (D) None of these

3. The sum of numbers in the n^{th} group of the following
(1, 3), (5, 7, 9, 11), (13, 15, 17, 19, 21, 23) , ... is
(A) $\frac{n(n+1)(n+2)}{3}$ (B) $2n^3$ (C) $n^2(n+1)^2$ (D) $4n^3$

4. If S denote the sum to infinity and S_n the sum of n terms of the series $1+\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+...$ such that $S - S_n < \frac{1}{300}$, then the least value of n is
(A) 4 (B) 5 (C) 6 (D) 7

5. If a, b, c are three positive real numbers, then the minimum value of the expression $\frac{b+c}{a}+\frac{c+a}{b}+\frac{a+b}{c}$ is
(A) 1 (B) 2 (C) 3 (D) None of these

6. If $x_i > 0$, i = 1, 2, …., 50 and $x_1 + x_2 + … + x_{50} = 50$, then the minimum value of $\frac{1}{x_1}+\frac{1}{x_2}+...+\frac{1}{x_{50}}$ equals to
(A) 50 (B) $(50)^2$ (C) $(50)^3$ (D) $(50)^4$

7. The value of $\frac{1}{6.10}+\frac{1}{10.14}+\frac{1}{14.18}+....\infty$ equals to
(A) $\frac{1}{(24)^2}$ (B) $\frac{1}{6}$ (C) $\frac{1}{24}$ (D) $\frac{1}{(24)^3}$

8. Let r^{th} term of a series be given by $T_r = \frac{r}{1-3r^2+r^4}$. Then $\lim_{n\to\infty}\sum_{r=1}^{n}T_r$ is
(A) 3/2 (B) 1/2 (C) –1/2 (D) –3/2

9. A sequence $a_1, a_2 …. a_n$ of real numbers is such that $a_1 = 0$, $|a_2| = |a_1 - 2|$, $|a_3| = |a_2 - 2|$, ….. $|a_n| = |a_{n-1} - 2|$. Then the maximum value of the arithmetic mean of these numbers is
(A) 1 (B) 4n (C) n (D) none of these

10. If $x_1, x_2, … x_{20}$ are in H.P. then $x_1 x_2 + x_2x_3 + … + x_{19}x_{20}$ =
(A) $x_1 x_{20}$ (B) $19 x_1x_{20}$ (C) $20 x_1x_{20}$ (D) none of these

11. The first two terms of an H.P. are $\frac{2}{5}$ and $\frac{12}{23}$. The value of the largest term of the H.P. is
(A) $\frac{72}{73}$ (B) 6 (C) $\frac{1}{6}$ (D) none of these

12. $\frac{1}{1^2.3^2}+\frac{2}{3^2.5^2}+\frac{3}{5^2.7^2}+....$ up to n terms equals to

(A) $\frac{n+1}{2n+1}$ (B) $\frac{n(n+1)}{2(2n+1)^2}$ (C) $\frac{n}{2n-1}$ (D) None of these

13. If abc = 8 and a, b, c > 0, then the minimum value of (2 + a) (2 + b) (2 + c) is
(A) 32 (B) 64 (C) 8 (D) 10

14. Coefficient of x^{49} in the polynomial $\left(x-\frac{1}{1\times 3}\right)\left(x-\frac{2}{1\times 3\times 5}\right)......\left(x-\frac{50}{1\times 3\times ......\times 101}\right)$ is

(A) $\frac{1}{2}-\frac{1}{1\times 3\times ......\times 101}$ (B) $-\frac{1}{2}\left(1-\frac{1}{1\times 3\times ......\times 101}\right)$

(C) $\frac{49}{1\times 3\times ......\times 101}$ (D) $\frac{50}{1\times 3\times ......\times 101}$

15. Let $\sum_{r=1}^{n} r^4 = f(n)$, then $\sum_{r=1}^{n}(2r-1)^4 =$

(A) f (2n) –16 f (n); $\forall$ n $\in$ N (B) f (n) –16 f$\left(\frac{n-1}{2}\right)$, when n is odd

(C) f (n) –16 f $\left(\frac{n}{2}\right)$, when n is even (D) none of these

16. The co-efficient of x^{n-2} in $(x-1)(x-2)(x-3)..........(x-n)$ is

(A) $\frac{n(n^2+1)(3n+1)}{24}$ (B) $\frac{n(n^2-1)(3n+2)}{24}$

(C) $\frac{n(n^2+1)(3n+4)}{24}$ (D) None of these

17. If a,b,c, are digits, then the rational number represented by 0.cababab….is
(a) cab/990 (b) (99c + ab) / 990
(c) (99c + 10a + b) / 99 (d) (99c + 10a + b) / 990

18. If $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+.......\infty=\frac{\pi^4}{90}$ then $\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+.......\infty$ is equal to

(a) $\frac{\pi^4}{96}$ (b) $\frac{\pi^4}{45}$ (c) $\frac{\pi^4}{90}$ (d) $\frac{\pi^4}{46}$

19. $\sum_{i=1}^{n}\sum_{j=1}^{i}\sum_{k=1}^{j}1=.......$

(a) $\frac{n(n+1)(n+2)}{6}$ (b) $\sum n^2$ (c) $\frac{n(n-1)(n-2)}{6}$ (d) none of these

20 If $I_n = \int_0^{\pi/4}\tan^n x\,dx$, then $\frac{1}{I_2+I_4}$, $\frac{1}{I_3+I_5}$, $\frac{1}{I_4+I_6}$ are in

(A) A.P (B) G.P

(C) H.P (D) none of these

21 If $x > 1, y > 1, z > 1$ are in G.P, then $\frac{1}{1+\ln x}, \frac{1}{1+\ln y}, \frac{1}{1+\ln z}$ are in…………………..

22. If $a^x = b^y = c^z = d^u$ and a, b, c, d are in G.P., then x, y, z, u are in …………………….

23. Let $a_1, a_2, a_3, \ldots, a_{10}$ be in AP and $h_1, h_2, h_3, \ldots, h_{10}$ be in H.P. If $a_1 = h_1 = 2$ and $a_{10} = h_{10} = 3$ then a_4h_7 is
(A) 2 (B) 3
(C) 5 (D) 6

24. In the sequence 1, 2, 2, 3, 3, 3, 4, 4, 4, 4 .... , where n consecutive terms have the value n, the 150th term is
(A) 17 (B) 16
(C) 18 (D) none of these

25. If $a, a_1, a_2 \ldots a_{2n-1}, b$ are in A.P, $a, b_1, b_2 \ldots b_{2n-1}, b$ are in G.P. and $a\ c_1, c_2 \ldots c_{2n-1}, b$ are in H.P. where a, b are positive then the equation $a_nx^2 - b_nx + c_n = 0$ has its roots
(A) real and unequal (B) real and equal
(C) imaginary (D) do not exist

26. If $\sum_{k=1}^{n}\left[\sum_{m=1}^{k} m\right] = an^4 + bn^3 + cn^2 + dn + e$, then
(A) $a = \frac{1}{12}, e = \frac{1}{12}$ (B) $a = 0, e = 0$
(C) $a = 0, e = \frac{1}{12}$ (D) $a = \frac{1}{12}, e = 0$

27. In the above question find the values of b, c and d ?
…………………………………………………….

29. If mth, nth and pth terms of an A.P. and G.P. are equal and are respectively x, y, z then
(A) $x^yy^zz^x = x^zy^xz^y$ (B) $(x - y)^x (y - z)^y = (z - x)^z$
(C) $(x - y)^z (y - z)^x = (z - x)^y$ (D) none of these

30. Coefficient of x^8 in $(x -1) (x - 2) (x -3) \ldots (x - 10)$ is
(A) 980 (B) 1395 (C) 1320 (D) none of these .

31. If the sum to n terms of an A.P. is $cn(n -1)$, where $c \neq 0$. The sum of the squares of these terms is
(A) $c^2n^2(n + 1)^2$ (B) $\frac{2}{3} c^2n (n -1) (2n -1)$
(C) $\frac{2}{3} c^2n (n + 1) (2n + 1)$ (D) none of these

ANSWERS

LEVEL –I

1.	B	2.	C	3.	A	4.	D
5.	D	6.	B	7.	A	8.	B
9.	C	10.	C	11.	B	12.	B
13.	B	14.	B	15.	C	16.	C
17.	C	18.	3ad	19.	C	20.	A
21.	C	22.	D				
23.	D	24.	A				
25.	C	26.	B				
27.	C	28.	A				

29.	D	30.	C	31.	B	32.	D
33.	D	34.	D				

LEVEL –II

1.	A	2.	A	3.	A	4.	C
5.	A	6.	D	7.	A	8.	A
9.	B	10.	B	11.	A	12.	A
13.	B	14.	A	15.	B	16.	C
17.	C	18.	B	19.	C	20.	A
21.	C	22.	C	23.	A	24.	B
25.	A	26.	C	27.	A	28.	C
29.	B	30.	D	31.	C	32.	D
33.	B	34.	C	35.	A	36.	A
37.	C	38.	A	39.	D	40.	A
41.	A	42.	A	43.	D	44.	A
45.	B	46.	B	47.	A	48.	D
49.	B	50.	B	51.	B		
52.	C	53.	$\frac{n^2(n+1)^2}{4}-1$	54.	-5555	55.	$n - 1 + 2^{-n}$
56.	H.P.	57.	B	58.	D	59.	C
60.	D	61.	A	62.	D	63.	C
64.	B	65.	D	66.	B	67.	C
68.	B	69.	C	70.	D	71.	D
72.	B	73.	D	74.	B	75.	C

LEVEL –III

1.	D	2.	C	3.	D	4.	C
5.	D	6.	A	7.	C	8.	C
9.	A	10.	B	11.	B	12.	B
13.	B	14.	B	15.	A	16.	B
17.	D	18.	A	19.	A	20.	C
21.	H.P.	22.	H.P.				
23.	B	24.	A				
25.	B	26.	B				
27.	$\frac{1}{6}, \frac{1}{2}, \frac{1}{3}$	29.	A	30.	C	31.	B