15. If $f(x)=\dfrac{1}{1+x}$, then $f^{(n)}(0)=$

(A) $(-1)^n n!$ (B) $\dfrac{(-1)^n}{n!}$

(C) $\dfrac{1}{n!}$ (D) $\dfrac{1}{n}$

16. If $u(x,y)=x^y+y^x$, then $u_x(e,1)$ is

(A) e (B) 1

(C) $e+1$ (D) $2e$

17. $\underset{x\to5}{Lt}\dfrac{x^k-5^k}{x-5}=500$, then the positive value of k is

(A) 3 (B) 4

(C) 5 (D) 6

18. If $A=\begin{bmatrix}3 & -1\\ -4 & 5\end{bmatrix}$, then the value of $|AA^T|$ is

(A) 3^2 (B) 4^2

(C) 5^2 (D) 11^2

19. If $(G,*)$ is a group, $a,b\in G$, then $(b^{-1}*a*b)^3=$

(A) $(b^{-1})^3*a^3*b^3$ (B) $b^{-1}*a^3*b$

(C) $b^{-1}*a*b^3$ (D) $(b^{-1})^3*a*b^3$

20. If $3-i$ is a solution of $x^2-6x+k=0$, then $k=$

(A) 5 (B) $\sqrt{5}$
(C) $\sqrt{10}$ (D) 10

21. For the curve $x=e^t\cos t$, $y=e^t\sin t$, the tangent line at t is parallel to the x-axis when t is equal to

(A) $\frac{-\pi}{4}$ (B) $\frac{\pi}{4}$
(C) $\frac{\pi}{2}$ (D) 0

22. If $u=\log\left(e^x+e^y\right)$, then $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=$

(A) e^x+e^y (B) $\frac{1}{e^x+e^y}$
(C) 2 (D) 1

23. The number of points of inflection of the curve $y=x^{1/3}$ is

(A) 0 (B) 1
(C) 2 (D) 3

24. If $(x+iy)^{\frac{1}{3}}=a+ib$, then $\frac{x}{a}+\frac{y}{b}$ is equal to

(A) $4\left(a^2-b^2\right)$ (B) $4ab$
(C) $4\left(a^2+b^2\right)$ (D) $5ab$

25. If $\sin x$ is an integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$, then P can be

(A) $\log \sin x$ (B) $\cot x$
(C) $\sin x$ (D) $\log \cos x$

26. The interval in which the function $(x-3)^2$ is strictly increasing, is

(A) $(-\infty, 3)$ (B) $(-3, \infty)$
(C) $(3, \infty)$ (D) $(-\infty, \infty)$

27. Which of the following is a root of the equation $\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = 0$?

(A) $-a$ (B) $2a$
(C) $-2a$ (D) $3a$

28. A train 280m long, running with a speed of 63 km/hour will pass a pillar in

(A) 15 sec (B) 16 sec
(C) 18 sec (D) 20 sec

29. The ratio of the areas of the incircle and the circumcircle of a square is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{1}{4}$ (D) 1

30. If every element in a group is self-inverse, then the group is

(A) cyclic
(B) non-abelian
(C) cyclic and abelian
(D) abelian

31. The angle between the asymptotes of the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$, with the eccentricity e, is

(A) $\tan^{-1}\left(\frac{b}{a}\right)$
(B) $2\tan^{-1}\left(\frac{a}{b}\right)$
(C) $2\sec^{-1}(e)$
(D) $2\sec^{-1}\left(\frac{1}{e}\right)$

32. The integrating factor of $\frac{dy}{dx}+y\cot x=4x\operatorname{cosec} x$ is

(A) $\operatorname{cosec} x$
(B) $\cot x$
(C) $\cos x$
(D) $\sin x$

33. The conjugate of $i^{13}+i^{14}+i^{15}+i^{16}$ is

(A) 1
(B) -1
(C) 0
(D) $-i$

34. The line $lx-2y+3=0$ is a tangent to the parabola $4y^2=x$ if $l=$

(A) 12
(B) $\frac{1}{12}$
(C) $\pm\frac{1}{3}$
(D) 3

35. If $x+y=22$ and $x^2+y^2=404$, then $xy=$

(A) 40
(B) 44
(C) 80
(D) 88

36. If the remainder and the quotient when 4150 divided by x are 25 and 55, then $x =$

(A) 65 (B) 70
(C) 75 (D) 80

37. The largest number from $\sqrt{2}, \sqrt[3]{3}$ and $\sqrt[4]{4}$ is

(A) $\sqrt{2}$ (B) $\sqrt[4]{4}$
(C) $\sqrt[3]{3}$ (D) $\sqrt{2} = \sqrt[3]{3} = \sqrt[4]{4}$

38. In the group G = {4, 8, 12, 16} under multiplication modulo 20, the identity element is

(A) 4 (B) 8
(C) 12 (D) 16

39. The set $G = \left\{ \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix} \Big/ a, b \in R \right\}$ under matrix multiplication forms

(A) an abelian group (B) non-abelian group
(C) monoid but not a group (D) None of the above

40. If $(1+2+3+\ldots.+n)^x = (1^3+2^3+\ldots.+n^3)^2$, then $x =$

(A) 1 (B) 3
(C) 4 (D) 2

41. The function f whose graph passes through (0,7/3) and whose derivative is $x\sqrt{1-x^2}$ is given by

(A) $f(x)=\left(-\frac{1}{3}\right)\left[\left(1-x^2\right)^{\frac{3}{2}}-8\right]$

(B) $f(x)=\left(\frac{1}{3}\right)\left[\left(1-x^2\right)^{\frac{3}{2}}+8\right]$

(C) $f(x)=\left(-\frac{1}{3}\right)\left[\left(\sin^{-1}x\right)+7\right]$

(D) $f(x)=-\frac{1}{3}\left[\left(1-x^2\right)^3+8\right]$

42. If a, b, c are distinct nonzero integers such that a, ab, abc are in A.P., then

(A) $c=1$
(B) $c=2$
(C) $c=3$
(D) $c=4$

43. If A is a square matrix such that $A^3=0$, then $(I+A)^{-1}$ is

(A) $I-A$
(B) $I+A^{-1}$
(C) $I+A+A^2$
(D) $I-A+A^2$

44. Volume of the parallelopiped whose conterminal edges are $2\vec{i}-3\vec{j}+4\vec{k}$, $\vec{i}+2\vec{j}-2\vec{k}$, $3\vec{i}-\vec{j}+k$ is

(A) 5 units
(B) 6 units
(C) 7 units
(D) 8 units

45. The length of the latus rectum of the ellipse $5x^2 + 9y^2 = 45$, is

(A) $\frac{5}{3}$
(B) $\frac{10}{3}$
(C) $\frac{2\sqrt{5}}{5}$
(D) $\frac{\sqrt{5}}{3}$

46. If $f(x) = \begin{vmatrix} \sin x + \sin 2x + \sin 3x & \sin 2x & \sin 3x \\ 3 + 4\sin x & 3 & 4\sin x \\ 1 + \sin x & \sin x & 1 \end{vmatrix}$, then the value of $\int_0^{\pi/2} f(x)dx$ is

(A) 3
(B) 2/3
(C) 1/3
(D) 0

47. If $f'(x)$ is continuous at $x = 0$ and $f''(0) = a$, then the value of $\lim_{x\to 0}\left[\frac{2f(x) - 3f(2x) + f(4x)}{x^2}\right]$ is

(A) a
(B) $3a$
(C) $4a$
(D) $6a$

48. If $y^2 = P(x)$ is a polynomial of degree 3, then $2\frac{d}{dx}\left(y^3\frac{d^2y}{dx^2}\right)$ is equal to

(A) $P(x) + P'(x)$
(B) $P(x)\ P'(x)$
(C) $P(x)\ P'''(x)$
(D) a constant

49. The least positive integer to which $79 \times 101 \times 125 \equiv \text{mod}11$ is

(A) 5
(B) 6
(C) 4
(D) 8

50. Which one of the following subsets of S_3 is a subgroup of S_3?

(A) $\left\{\begin{pmatrix}1 & 2 & 3\\ 1 & 2 & 3\end{pmatrix}, \begin{pmatrix}1 & 2 & 3\\ 2 & 3 & 1\end{pmatrix}\right\}$ (B) $\left\{\begin{pmatrix}1 & 2 & 3\\ 1 & 3 & 2\end{pmatrix}, \begin{pmatrix}1 & 2 & 3\\ 2 & 1 & 3\end{pmatrix}\right\}$

(C) $\left\{\begin{pmatrix}1 & 2 & 3\\ 1 & 2 & 3\end{pmatrix}, \begin{pmatrix}1 & 2 & 3\\ 3 & 2 & 1\end{pmatrix}\right\}$ (D) $\left\{\begin{pmatrix}1 & 2 & 3\\ 1 & 2 & 3\end{pmatrix}, \begin{pmatrix}1 & 2 & 3\\ 3 & 1 & 2\end{pmatrix}\right\}$

51. Lines $ax + by + c = 0$ where $3a + 2b + 4c = 0$, $a, b, c \in R$ are concurrent at the point

(A) (3, 2) (B) (2, 4)

(C) (3, 4) (D) $\left(\frac{3}{4}, \frac{1}{2}\right)$

52. The number of points (p, q) such that $p, q \in \{1,2,3,4\}$ and the equation $px^2 + qx + 1 = 0$ has real roots is

(A) 7 (B) 8

(C) 9 (D) 10

53. The complex numbers $\sin x + i\cos 2x$ and $\cos x - i\sin 2x$ are conjugates to each other for

(A) $x = n\pi$ (B) $x = n\pi/2$

(C) $x = 0$ (D) no value of x

54. If $A = \begin{bmatrix}2 & 0 & 0\\ 0 & 2 & 0\\ 0 & 0 & 2\end{bmatrix}$, then A^5 is

(A) A (B) $4A$

(C) $16A$ (D) $32A$

55. If $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}$, then $|A|$ lies in

(A) [2, 3]
(B) [3, 4]
(C) [2, 4]
(D) [3, 5]

56. If T_p, T_q, T_r are the p^{th}, q^{th}, r^{th} terms of an A.P., then $\begin{vmatrix} T_p & T_q & T_r \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix} =$

(A) 1
(B) –1
(C) 0
(D) 2

57. Sum of 1+4+7+10+......+n terms is

(A) $\dfrac{n(3n-7)}{2}$
(B) $\dfrac{n(3n-1)}{2}$
(C) $\dfrac{n(3n+1)}{3}$
(D) $\dfrac{(3n-1)(3n+1)}{3}$

58. If $f(2) = 4$ and $f'(2) = 1$, then $\lim\limits_{x \to 2}\left[\dfrac{xf(2) - 2f(x)}{x-2}\right] =$

(A) 1
(B) –2
(C) 2
(D) 3

59. If $4\sin^{-1}x+\cos^{-1}x=\pi$, then x equals

(A) $\frac{1}{2}$
(B) $\frac{\sqrt{3}}{2}$
(C) $-\frac{1}{2}$
(D) $-\frac{1}{4}$

60. The curve represented by $x=a(\cosh\theta+\sinh\theta),\ y=b(\cosh\theta-\sinh\theta)$ is

(A) a hyperbola
(B) an ellipse
(C) a parabola
(D) a circle

61. Solution of $\frac{2x-3}{3x-5}\geq 3$ is

(A) $\left[1,\frac{12}{7}\right)$
(B) $\left(\frac{5}{3},\frac{12}{7}\right]$
(C) $\left(-\infty,\frac{5}{3}\right)$
(D) $\left[\frac{12}{7},\infty\right)$

62. The number of integral solutions of $\frac{x+2}{x^2+1}>\frac{1}{2}$ is

(A) 4
(B) 5
(C) 3
(D) 2

63. $\left(\frac{1+i}{1-i}\right)^2+\left(\frac{1-i}{1+i}\right)^2$ is

(A) $2i$
(B) $-2i$
(C) -2
(D) 2

64. If z is any complex number such that $|z+4| \leq 3$, then the least value and the greatest value of $|z+1|$ are

(A) 1, 6
(B) 0, 6
(C) 2, 8
(D) 2, 6

65. If $z = i\log\left(2-\sqrt{3}\right)$, then $\cos z$ is equal to

(A) i
(B) $2i$
(C) 1
(D) 2

66. Locus of the point z satisfying the equation $|iz-1|+|z-i|=2$ is

(A) a straight line
(B) a circle
(C) an ellipse
(D) a pair of straight line

67. The equation not representing a circle is given by

(A) $\text{Re}\left(\dfrac{1+z}{1-z}\right)=0$
(B) $z\bar{z}+iz-i\bar{z}+1=0$
(C) $\arg\left(\dfrac{z-1}{z+1}\right)=\dfrac{\pi}{2}$
(D) $\left|\dfrac{z-1}{z+1}\right|=1$

68. If the sum of a number and its square is 240, what is the number?

(A) 12
(B) 13
(C) 14
(D) 15

69. The common roots of the equation $z^3+2z^2+2z+1=0$ and $z^{1984}+z^2+1=0$ are

(A) $-1, \omega$
(B) $-1, \omega^2$
(C) ω, ω^2
(D) $1, -1$

A

70. The maximum value of $|z|$ when z satisfies the condition $\left|z+\frac{2}{z}\right|=2$ is

(A) $\sqrt{3}-1$ (B) $\sqrt{3}+1$

(C) $\sqrt{3}$ (D) $\sqrt{2}+\sqrt{3}$

71. The product of all values of $(\cos\alpha+i\sin\alpha)^{\frac{3}{5}}$ is

(A) 1 (B) $\cos\alpha+\sin\alpha$

(C) $\cos 3\alpha+i\sin 3\alpha$ (D) $\cos 5\alpha+i\sin 5\alpha$

72. If $\log_{10} 2$, $\log_{10}(2^x-1)$ and $\log_{10}(2^x+3)$ be three consecutive terms of an A.P., then

(A) $x=0$ (B) $x=1$

(C) $x=\log_2 5$ (D) $2^x=-1$

73. The sum of positive terms of the series $10+\frac{67}{7}+\frac{64}{7}+\ldots$ is

(A) $\frac{352}{7}$ (B) $\frac{437}{7}$

(C) $\frac{752}{7}$ (D) $\frac{852}{7}$

74. If the sum of first n terms of a series is $5n^2 + 2n$, then its second term is

(A) 16
(B) 17
(C) $\frac{27}{14}$
(D) $\frac{56}{15}$

75. Sum of the series $1 + 2.2 + 3.2^2 + 4.2^3 + \ldots + 100.2^{99}$ is

(A) $100.2^{100} + 1$
(B) $99.2^{100} - 1$
(C) $99.2^{99} + 1$
(D) $100.2^{100} - 1$

76. If $\frac{1}{4-3i}$ is a root of $ax^2 + bx + 1 = 0$, where a, b are real, then

(A) $a = 25, b = -8$
(B) $a = 1, b = -\frac{8}{25}$
(C) $a = 5, b = 4$
(D) $a = 5, b = 8$

77. If $ax^2 + bx + 10 = 0$ does not have two distinct real roots, then the least value of $5a + b$ is

(A) –3
(B) –2
(C) 3
(D) 0

78. The number of real solutions of the equation $e^x = x$ is

(A) 1
(B) 2
(C) 0
(D) infinite

79. If α and β are the roots of $x^2 - 2x + 4 = 0$, then the value of $\alpha^6 + \beta^6$ is

(A) 32
(B) 64
(C) 128
(D) 256

80. If a, b, c are three natural numbers in A.P. and $a+b+c=21$, then the possible number of values of the ordered triplet (a,b,c) is

(A) 15 (B) 14
(C) 13 (D) 11

81. Number of divisors of the form $4n+2(n \geq 0)$ of the integer 240 is

(A) 4 (B) 8
(C) 10 (D) 3

82. If $\left(1+x+x^2+x^3\right)^5 = \sum_{k=0}^{15} a_k x^k$, then $\sum_{k=0}^{7} a_{2k}$ is equal to

(A) 128 (B) 256
(C) 512 (D) 1024

83. The digit at the unit place in the number $19^{2005}+11^{2005}-9^{2005}$ is

(A) 0 (B) 1
(C) 2 (D) 8

84. For $|x|<1$, the constant term in the expansion of $\dfrac{1}{(x-1)^2(x-2)}$ is

(A) 2 (B) 1
(C) 0 (D) $\dfrac{-1}{2}$

85. The matrix $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ is

(A) symmetric (B) unique
(C) orthogonal (D) scalar

86. If $D=\begin{vmatrix}1 & a & b\\ 1 & b & c\\ 1 & c & a\end{vmatrix}$, then $\begin{vmatrix}a & b & c\\ b & c & a\\ 1 & 1 & 1\end{vmatrix}$ equals

(A) 0
(B) D
(C) $-D$
(D) $3D$

87. If a, b, c are in A.P., then the value of $\begin{vmatrix}x+1 & x+2 & x+a\\ x+2 & x+3 & x+b\\ x+3 & x+4 & x+c\end{vmatrix}$ is

(A) 3
(B) –3
(C) 0
(D) 1

88. If one of the roots of the equation $\begin{vmatrix}7 & 6 & x\\ 2 & x & 2\\ x & 3 & 7\end{vmatrix}=0$ is $x=-9$, then the other two roots are

(A) $\{2,6\}$
(B) $\{3,6\}$
(C) $\{2,7\}$
(D) $\{3,7\}$

89. If $f(x)=\begin{vmatrix}1 & x & x+1\\ 2x & x(x-1) & (x+1)x\\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1)\end{vmatrix}$, then $f(100)$ is equal to

(A) 0
(B) 1
(C) 100
(D) –100

90. If x, y, z are in A.P. with common difference d and the rank of the matrix $\begin{vmatrix} 4 & 5 & x \\ 5 & 6 & y \\ 6 & k & z \end{vmatrix}$ is 2, then the values of d and k are

(A) $\frac{\lambda}{4}$, arbitrary number
(B) arbitrary number, 7
(C) x, 5
(D) $\frac{\lambda}{2}, 6$

91. Sum of the series $1+\frac{3}{1!}+\frac{5}{2!}+\frac{7}{3!}+\ldots$ is

(A) e^{-1}
(B) $2e$
(C) $3e$
(D) $5e-7$

92. The coefficient of x^k in the expansion of $\frac{1-2x-x^2}{e^{-x}}$ is

(A) $\frac{1-k-k^2}{k!}$
(B) $\frac{k^2+1}{k!}$
(C) $\frac{1-k}{k!}$
(D) $\frac{1}{k!}$

93. If $\frac{1}{e^{3x}}\left(e^x+e^{5x}\right)=a_0+a_1x+a_2x^2+\ldots$, then $2a_1+2^3a_3+2^5a_5+\ldots$ is equal to

(A) e
(B) e^{-1}
(C) 1
(D) 0

94. The number of mappings from the set $A = \{1, 2, ... 100\}$ to set $B = \{1, 2\}$ is

(A) $2^{100} - 2$
(B) 2^{100}
(C) $2^{99} - 2$
(D) 2^{99}

95. Two finite sets A and B have m and n elements respectively. If the total number of subsets of A is 112 more than the total number of subsets of B, then the value of m is

(A) 7
(B) 9
(C) 10
(D) 12

96. The maximum value of $3\cos\theta + 4\sin\theta$ is

(A) 3
(B) 4
(C) 5
(D) 7

97. $\sqrt{3}\,\text{cosec}\,20^\circ - \sec 20^\circ$ is equal to

(A) 2
(B) $2 \sin 20^\circ \text{ cosec } 40^\circ$
(C) 4
(D) $4 \sin 20^\circ \text{ cosec } 40^\circ$

98. If $12\cot^2\theta - 31\,\text{cosec}\,\theta + 32 = 0$, then the value of $\sin\theta$ is

(A) $\frac{3}{5}$ or 1
(B) $\frac{2}{3}$ or $-\frac{2}{3}$
(C) $\frac{4}{5}$ or $\frac{3}{4}$
(D) $\pm\frac{1}{2}$

99. If $\alpha + \beta - \gamma = \pi$, then $\sin^2\alpha + \sin^2\beta - \sin^2\gamma$ is equal to

(A) $2\sin\alpha\sin\beta\cos\gamma$
(B) $2\cos\alpha\cos\beta\cos\gamma$
(C) $2\sin\alpha\sin\beta\sin\gamma$
(D) $2\cos\alpha\,\sin\beta\,\cos\gamma$

100. If $A+B=45^{o}$, then $(\cot A-1)(\cot B-1)$ is equal to

(A) 1
(B) -2
(C) -1
(D) 2

101. If $\tan x=\frac{b}{a}$, then the value of $a\cos 2x+b\sin 2x$ is

(A) 1
(B) ab
(C) b
(D) a

102. If $\cos 2\alpha=\frac{3\cos 2\beta-1}{3\cos 2\beta}$, then $\tan\alpha$ is equal to

(A) $\sqrt{2}\tan\beta$
(B) $\tan\beta$
(C) $\sin 2\beta$
(D) $\sqrt{2}\cot 2\beta$

103. The equation $\sqrt{3}\sin x+\cos x=4$ has

(A) only one solution
(B) two solutions
(C) infinitely many solutions
(D) no solution

104. The general value of θ in the equations $\cos\theta=\frac{1}{\sqrt{2}}$, $\tan\theta=-1$ is

(A) $2n\pi\pm\frac{\pi}{6},\ n\in I$
(B) $2n\pi\pm\frac{7\pi}{4},\ n\in I$
(C) $n\pi+(-1)^{n}\frac{\pi}{3},\ n\in I$
(D) $n\pi+(-1)^{n}\frac{\pi}{4},\ n\in I$

105. The general solution of the equation $4\sin^{4}x+\cos^{4}x=1$ is

(A) $x=2n\pi$
(B) $x=n\pi+1$
(C) $x=(n+2)\pi$
(D) $x=n\pi$ or $n\pi\pm\sin^{-1}\sqrt{\frac{2}{5}}$

106. The sides of triangle ABC are $AB = \sqrt{13}\ cm$, $BC = 4\sqrt{3}\ cm$, $CA = 7\ cm$. Then $\sin\theta$, where θ is the smallest angle of the triangle is equal to

(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$

(C) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ (D) $\frac{3}{2}$

107. If $\sin(A+B+C)=1, \tan(A-B)=\frac{1}{\sqrt{3}}$ and $\sec(A+C)=2$, then

(A) $A=90^\circ, B=60^\circ, C=30^\circ$ (B) $A=120^\circ, B=60^\circ, C=30^\circ$

(C) $A=60^\circ, B=30^\circ, C=0^\circ$ (D) $A=60^\circ, B=30^\circ, C=30^\circ$

108. If in a triangle ABC, $a=6cm$, $b=8cm$, $c=10cm$, then the value of $\sin 2A$ is

(A) $\frac{6}{25}$ (B) $\frac{8}{25}$

(C) $\frac{10}{25}$ (D) $\frac{24}{25}$

109. In a triangle ABC, if $b+c=2a$ and $\angle A=60^\circ$, then triangle ABC is

(A) equilateral (B) right angled

(C) isosceles (D) scalene

110. The solution of $\sin^{-1}x - \sin^{-1}2x = \pm\frac{\pi}{3}$ is

(A) $\pm\frac{1}{3}$ (B) $\pm\frac{1}{4}$

(C) $\pm\frac{\sqrt{3}}{2}$ (D) $\pm\frac{1}{2}$

111. If the mean of n observation $1^2, 2^2, 3^2, \ldots\ldots, n^2$ is $\frac{46n}{11}$, then n is equal to

(A) 11 (B) 12
(C) 23 (D) 22

112. The standard deviation of n observation $x_1, x_2, x_3, \ldots\ldots, x_n$ is 2. If $\sum_{i=1}^{n} x_i = 20$ and $\sum_{i=1}^{n} x_i^2 = 100$, then n is

(A) 10 or 20 (B) 5 or 10
(C) 5 or 20 (D) 5 or 15

113. If the coefficient of variation of a distribution is 45% and the mean is 12, then its standard deviation is

(A) 5.2 (B) 5.3
(C) 5.4 (D) 10.8

114. If a point $P(4,3)$ is shifted by a distance $\sqrt{2}$ units parallel to the line $y = x$, then coordinates of P in the new position are

(A) $(5, 4)$ (B) $(5+\sqrt{2}, 4+\sqrt{2})$

(C) $(5-\sqrt{2}, 4-\sqrt{2})$ (D) $(3, 4)$

115. If the lines $x^2+2xy-35y^2-4x+44y-12=0$ and $5x+\lambda y-8=0$ are concurrent, then the value of λ is

(A) 0
(B) 1
(C) –1
(D) 2

116. If three distinct and real normals can be drawn to $y^2=8x$ from the point $(a,0)$, then

(A) $a>2$
(B) $a\in(2,4)$
(C) $a<4$
(D) $a>4$

117. If the line $y=2x+c$ is tangent to the ellipse $\frac{x^2}{8}+\frac{y^2}{4}=1$, then the value of c is

(A) ± 6
(B) $\pm 2\sqrt{7}$
(C) $\pm 2\sqrt{5}$
(D) $\pm 2\sqrt{3}$

118. The sum of the distances of a point $(2,-3)$ from the foci of an ellipse $16(x-2)^2+25(y+3)^2=400$ is

(A) 8
(B) 6
(C) 50
(D) 32

119. If $\sin^{-1}x+\sin^{-1}y=\frac{\pi}{2}$, then $\frac{dy}{dx}$ is equal to

(A) $\frac{-x}{y}$
(B) $\frac{x}{y}$
(C) $\frac{y}{x}$
(D) $\frac{-y}{x}$

120. If $f(x^5) = 5x^3$, then $f'(x)$ is equal to

(A) $\frac{3}{\sqrt[5]{x^2}}$ (B) $\frac{3}{\sqrt[5]{x}}$

(C) $\frac{3}{x}$ (D) $\sqrt[5]{x}$

121. If $y = \tan^{-1}(\sec x - \tan x)$, then $\frac{dy}{dx}$ is equal to

(A) 2 (B) −2

(C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

122. If $y = e^{ax}\sin bx$, then $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + a^2y$ is equal to

(A) 0 (B) 1

(C) $-b^2y$ (D) $-by$

123. If $\sin y = x\sin(a+y)$, then $\frac{dy}{dx}$ is

(A) $\frac{\sin a}{\sin^2(a+y)}$ (B) $\frac{\sin^2(a+y)}{\sin a}$

(C) $\sin a \sin^2(a+y)$ (D) $\frac{\sin^2(a-y)}{\sin a}$

124. The function $f(x) = \log\left(\frac{1+x}{1-x}\right)$ satisfies the equation

(A) $f(x+2) - 2f(x+1) + f(x) = 0$

(B) $f(x) + f(x+1) = f\{x + (x+1)\}$

(C) $f(x) + f(y) = f\left(\frac{x+y}{1+xy}\right)$

(D) $f(x+y) = f(x)f(y)$

125. If $f : R \to R$ is defined by $f(x) = x^3$, then $f^{-1}(8)$ is equal to

(A) $\{2, 0\}$ (B) $\{2, 2\omega, 2\omega^2\}$

(C) $\{2, -2\}$ (D) $\{2\}$

PHYSICS

126. A sphere has a mass of 12.2 ± 0.1 kg and radius 10 ± 0.1 cm. The maximum % error in density is

(A) 1.22 (B) 3.83
(C) 1.33 (D) 0.38

127. A bus is standing at the bus stop. A man is in front of the bus at the stop. Suddenly the bus starts moving with an acceleration of 2 ms^{-2}. The man notices the bus moving after 2 seconds of its motion. With what constant speed the man should run so as to get into the bus in two seconds when he notices the bus moving?

(A) 4 ms^{-2} (B) 2 ms^{-2}
(C) 8 ms^{-2} (D) 6 ms^{-2}

128. A stone is dropped from a height of 100 m and simultaneously a stone is thrown up from ground with a velocity 40 m/s. They cross each other after

(A) 2 s
(B) 2.5 s
(C) 2.2 s
(D) 1.2 s

129. The momentum of a body is increased by 20%. Find the percentage increase in kinetic energy.

(A) 30%
(B) 44%
(C) 35%
(D) 20%

130. A simple pendulum has a time period T_1 when on Earth's surface and T_2 when taken to a height R above the Earth's surface. R is the radius of the Earth. The value of T_2/T_1 is

(A) 2
(B) 4
(C) 1
(D) $\sqrt{2}$

131. The radius of Earth is 6500 km. The mass of the Earth is 10 times the mass of Mars. An object weighs 100 N on the Earth's surface. Then its weight on the surface of the Mars' is (assume the diameter of the Earth and Mars is same)

(A) 10 N
(B) 20 N
(C) 80 N
(D) 65 N

132. A cube of side a is placed on an inclined plane of inclination θ. What is the maximum value of θ for which cube will not topple?

(A) 60°
(B) 15°
(C) 30°
(D) 45°

133. When equal volumes of two metals are mixed together, the specific gravity of the alloy is 4. When equal masses of the same metals are mixed together the specific gravity of the alloy is 3. What is the specific gravity of each metal?

(A) 4, 3 (B) 3, 5
(C) 2, 6 (D) 4, 2

134. A soft polythene bag weighs W when empty. It is filled with air of density ρ and weighed in air. Then what is its weight if the volume of the bag is V?

(A) $W + V\rho g$ (B) W
(C) $W - V\rho g$ (D) None of the above

135. The density of water is greater than the density of air. Even then clouds containing water vapour float. Because

(A) clouds have large amount of air
(B) clouds actually come down with a very small terminal velocity
(C) clouds actually move up with a very small terminal velocity
(D) the droplets in clouds are in the form of bubbles

136. The temperature of a black body increases from T to 2T. The factor by which the rate of emission will increase is

(A) 8 (B) 2
(C) 16 (D) 4