NDA MATHS PAPER – 1

1. If conjugate of a complex number is $\frac{1}{1-i}$ then complex number is
(a) $\frac{1}{i-i}$ (b) $\frac{-1}{i-1}$ (c) $\frac{1}{i+1}$ (d) $\frac{-1}{i+1}$

2. If $|z^2 - 1| = |z|^2 + 1$, then z lies in
(a) a circle (b) Imaginary axis (c) real axis (d) an ellipse

3. If cube root of unity are $1, w, w^2$, then roots of equation $(x-1)^3 + 8 = 0)$ are
(a) $-1, 1 - w^2, i - 2w^2$ (b) $-1, -1 + 2, -1 + 2w^2$
(c) $-1, -1, -1$ (d) None of these

4. What is argument of $-1 - \sqrt{3}i$?
(a) $\pi/3$ (b) $2\pi/3$ (c) $-2\pi/3$ (d) None

5. If one real root of equation $81\, x^2 + kx + 256 = 0$ is cube of other then value of k is
(a) 144 (b) 100 (c) -81 (d) -300

6. If λ is ratio of roots of equation $3m^2x^2 + m\,(m-4)\,x + 2 = 0$, then least value of m for which $\lambda + \frac{1}{\lambda} = 1$ is
(a) $-2 + \sqrt{2}$ (b) $4 - 3\sqrt{2}$ (c) $4 - 2\sqrt{3}$ (d) $2 - \sqrt{3}$

7. The equations $x^2 + 2x + 3 = 0$ and $a\,x^2 + bx + c = 0, a, b, c \in R$ have a common root, then $a : b : c$ is
(a) 3 : 2 : 1 (b) 1 : 3 : 2 (c) 3 : 1 : 2 (d) 1 : 2 : 3

8. The difference between roots of equation $x^2 + ax + 1 = 0$ is less than $\sqrt{5}$, then set of possible values of a is
(a) $(3, \infty)$ (b) $(-\infty, -3)$ (c) $(-3,3)$ (d) $(-3, \infty)$

9. The number of solutions of the equation $\log_4(x-1) = \log_2(x-3)$ is
(a) 2 (b) 1 (c) 0 (d) None

10. The number of ways in which 5 boys and 3 girls can be seated on a round table if particular boy and a particular girl never sit adjacent to each other is

(a) $7!$ (b) $5 \times 6!$ (c) $6 \times 6!$ (d) $5 \times 7!$

11. The sum $\sum_{r=1}^{10}(r^2+1)\times r!$ is equal to
(a) $11 \times 11!$ (b) $10 \times 11!$ (c) $11!$ (d) $10! \times 10!$

12. If letters of word "LETTER" are arranged, then in how many ways vowels never comes together?
(a) 120 (b) 60 (c) 180 (d) None

13. How many words can be formed by jumbling letter of word MISSISSIPPI in which no two S are adjacent?
(a) $7.\ 6_{c4}\ .\ 8_{c4}$ (b) $8\ .6_{c4}\ .7_{c4}$ (c) $6\ .7\ .8_{c4}$ (d) None

14. A committee of 11 members is to be formed from 8 male and 5 females. If m is member of ways of committee formed with atleast 6 males and n is number of ways of committee 6 males and n is number of ways committee formed with atleast 3 females, then
(a) $m+n=68$ (b) $m=n=78$ (c) $m=n=68$ (d) $m-n=8$

15. How many four digit odd numbers can be formed using digits 0, 1, 2, 3, 5, 7?
(a) 216 (b) 400 (c) 720 (d) 375

16. If coefficient of x^7 in expansion of $\left(x^2+\frac{1}{bx}\right)^{11}$ and x^{-7} in expansion of $\left(x-\frac{1}{bx^2}\right)^{11}, (b \neq 0)$ are equal, then value of b is
(a) 2 (b) -1 (c) 1 (d) -2

17. If the fourth term in expansion of $\left(x+x^{\log_2 x}\right)^7$ is 4480, then value of $x, (x \in N)$ is
(a) 3 (b) 4 (c) 2 (d) 1

18. If constant term in expansion of $\left(\sqrt{x}-\frac{k}{x^2}\right)^{10}$ is 405, then $|k|$ is
(a) 9 (b) 1 (c) 3 (d) 2

19. The positive value of λ for which coefficient of x^2 in expansion of $x^2\left(\sqrt{x}+\frac{\lambda}{x^2}\right)^{10}$ is 720, is
(a) 4 (b) 3 (c) $\sqrt{5}$ (d) $2\sqrt{2}$

20. If $(1+x+2x^2)^{20}=a_0+a_1x+a_2x^2+\cdots+a_{40}x^{40}$, then value of $a_1+a_3+a_5+\cdots+a_{37}$ is
(a) $2^{19}(2^{20}+21)$ (b) $2^{20}(2^{20}+21)$
(c) $2^{19}(2^{20}-21)$ (d) $2^{20}(2^{20}-21)$

21. If n $A.M's$ inserted between a and 100, such that ration of first and last mean is 1 : 7 and $a+n=33$, then value of n is
(a) 21 (b) 22 (c) 23 (d) 24

22. If three positive numbers a,b,c are in $A.P.$ such that $abc=8$. Then minimum Possible value of b is
(a) $4^{2/3}$ (b) $4^{1/3}$ (c) 4 (d) 2

23. The number of terms common to two $A.P's$ 3,7,11 ... 407 and 2,9,16 ... 709 is
(a) 14 (b) 12 (c) 17 (d) 13

24. The sum $1+2.3+3.3^2+\cdots+10.3^9$ is equal to
(a) $\frac{2.3^{12}+10}{4}$ (b) $\frac{19.3^{10}+1}{4}$ (c) $5.3^{10}-2$ (d) $\frac{9.3^{10}+1}{2}$

25. The sum of series $\frac{1}{2!}-\frac{1}{3!}+\frac{1}{4!}\ldots\infty$ is
(a) $e^{-1/2}$ (b) $e^{1/2}$ (c) e^{-2} (d) e^{-1}

26. Let $f: N\to N$ be a function such that $f(m+n)=f(m)+f(n)$ for every $m,n\in N$. If $f(6)=18$, then $f(2).f(3)$ is equal to
(a) 54 (b) 6 (c) 36 (d) 18

27. Let $R = \{(3,3),(6,6,),(9,9),(12,12),(6,12),(3,9),(3,12),(3,6)\}$ be a relation on set $A = \{3,6,9,12\}$, then R is
(a) reflexive and symmetric (b) an equivalence relation
(c) reflexive only (d) none

28. If $g(x) = x^2 + x - 1$ and $gof(x) = 4x^2 - 10x + 5$, then $f\left(\frac{5}{4}\right)$ is
(a) $-3/2$ (b) $-1/2$ (c) $1/2$ (d) $3/2$

29. The domain of function $f(x) = \frac{\sin^1(x-3)}{\sqrt{9-x^2}}$ is
(a) $[1.2]$ (b)$[2,3)$ (c) $[2,3]$ (d) $[1,2]$

30. Let set A and B have 2 and 4 elements respectively. Then number of subsets of A having atmost 3 elements are
(a) 219 (b) 56 (c) 93 (d) 120

31. The value of $\cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\frac{6\pi}{7}$ is
(a) -1 (b) $-1/2$ (c) $-1/3$ (d) $-1/4$

32. The value of $\cot(\pi/24)$ is
(a) $\sqrt{2} + \sqrt{3} + 2 - \sqrt{6}$ (b) $\sqrt{2} - \sqrt{3} - 2 + \sqrt{6}$
(c) $3\sqrt{2} - \sqrt{3} - \sqrt{6}$ (d) $\sqrt{2} + \sqrt{3} + 2 + \sqrt{6}$

33. If $A = \sin^2 x + \cos^4 x$ then
(a) $1 \le A \le 2$ (b) $\frac{3}{4} \le A \le \frac{3}{16}$
(c) $\frac{3}{4} \le A \le 1$ (d) $\frac{13}{16} \le A \le 1$

34. If $\cos(\propto +\beta) = \frac{4}{5}$ and $\sin(\propto -\beta) = \frac{5}{13}$. Then $\tan 2 \propto$ is $\left(0 \le \propto, \beta \propto \le \frac{\pi}{4}\right)$ is
(a) $25/16$ (b) $56/33$ (c) $19/20$ (d) $20/17$

35. The number of solutions of equation $\cos\left(x + \frac{\pi}{3}\right).\cos\left(x - \frac{\pi}{3}\right) = \frac{1}{4}\cos^2(2x)(x \in [-3\pi, 3\pi])$ is
(a) 8 (b) 5 (c) 6 (d) 7

36. If $15\sin^4\propto +10\cos^4\propto = 6(\propto\in R)$, then value of $27\sec^6\propto +8\operatorname{cosec}^6\propto$ is
(a) 350 (b) 250 (c) 400 (d) 500

37. The number of integral values of K for which equation $3\sin x + 4\cos x = K+1$, has a solution $(x \in R)$
(a) 8 (b) 9 (c) 10 (d) 11

38. The value of $\cot\left(\sum_{n=1}^{50}\tan^{-1}\left(\frac{1}{1+n+n^2}\right)\right)$ is
(a) $\frac{26}{25}$ (b) $25/26$ (c) $50/51$ (d) $52/51$

39. If X, Y, Z are in $A.P.$ and $\tan^{-1}x, \tan^{-1}y, \tan^{-1}z$ are also in A.P., Then
(a) $2x = 3y = 6z$ (b) $6x = 3y = 2z$
(c) $6x = 4y = 3z$ (d) $x = y = z$

40. If a, b, c are sides of triangle $A\ B\ C$ such that $\frac{a+b}{7} = \frac{b+c}{8} = \frac{C+a}{9}$. r and R are in radius and circumradius, then R/r is
(a) $5/2$ (b) 2 (c) $3/2$ (d) 1

41. If sides of triangle ABC are in $A.P.$ and greatest angle is double the smallest, then ratio of length of sides is
(a) 4 : 5 : 6 (b) 5 : 9 : 13 (c) 3 : 4 : 5 (d) 5 : 6 : 7

42. If centroid of an equilateral triangle ABC is origin and one side of triangle is along line $x+y=3$. If R and r are circum radius and in radius, then $(R+r)$ is
(a) $9/\sqrt{2}$ (b) $7\sqrt{2}$ (c) $3\sqrt{2}$ (d) $2\sqrt{2}$

43. In ΔABC medians AD and BE are drawn. If $AD = 4, < DAB = \frac{\pi}{6}$ and $\angle ABE = \frac{\pi}{3}$, then area of triangle ABC is
(a) $16/3$ (b) $3\sqrt{3}$ (c) $64/3$ (d) None

44. If $f_k(x) = \frac{1}{K}(\sin^k x + \cos^k x)$ for $K = 1, 2, 3 \ldots$ for all $x \in R$, then value of $f_4(x) - f_6(x)$ is

(a) $5/12$ (b) $1/4$ (c) $-1/12$ (d) $1/12$

45. A spherical ballon of radius 16m subtends angle 60° at eye of observer, while angle of elevation of its centre is $75°$. Then height of centre of ballon from ground is
(a) $8(\sqrt{6}+\sqrt{2})\text{m}$ (b) $8(\sqrt{6}-\sqrt{2})\text{m}$ (c) $8(\sqrt{3}+\sqrt{2})\text{m}$ (d) None

46. Two straight lines whose direction cosines are given by relations $l+m-n=0$,
$3l^2+m^2+cnl=0$, are parallel, then positive value of C is
(a) 6 (b) 4 (c) 2 (d) 3

47. If (a,b,c) is image of point $(1,2,-3)$ in the line $\frac{x+1}{2}=\frac{y-3}{-2}=\frac{z}{-1}$ then $(a+b+c)$ is
(a) 2 (b) -1 (c) 3 (d) 1

48. If Q be the foot to ⊥ drawn from point $P(1,2,3)$ to plane $x+2y+z=14$. If R is a point on the plane such that $\angle PRQ=60°$. Then area of triangle PQR is
(a) $\sqrt{3}/2$ (b) $\sqrt{3}$ (c) $2\sqrt{3}$ (d) 3

49. The distance of the point $(-1,2,-2)$ from line of intersection of planes $2x+3y+2z=0$ and $x-2y+z=0$ is
(a) $1/\sqrt{2}$ (b) $\sqrt{42}/2$ (c) $5/2$ (d) $\sqrt{34}/2$

50. What is radius of circle in which plane $x+2y+2z+7=0$ intersect sphere $x^2+y^2+z^2+2x-2y-4z-19=0$?
(a) 2 (b) 3 (c) 4 (d) 1

51. A parabola has the origin as its focus and line $x=2$ as directrix then vertex of parabola is
(a) $(2,0)$ (b) $(0,2)$ (c) $(1,0)$ (d) $(0,1)$

52. If eccentricity of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ $(a>b)$ is $1/4$. If it passes through $pt\left(-4\sqrt{\frac{2}{5}},3\right)$. Then a^2+b^2 is equal to
(a) 29 (b) 31 (c) 32 (d) 34

53. If the line $x-1=0$ is directrix of hyperbola $kx^2-y^2=6$, then hyperbola passes through the point
(a) $(-2\sqrt{5},6)$ (b) $(-\sqrt{5},3)$ (c) $(\sqrt{5},-2)$ (d) $(2\sqrt{5},3\sqrt{6})$

54. A triangle has a vertex at $(1,2)$ and midpoints of the two sides through it are$(-1,1)$ and $(2,3)$. Then centroid of triangle is
(a) $\left(\frac{1}{3},\frac{5}{3}\right)$ (b) $\left(1,\frac{7}{3}\right)$ (c) $\left(\frac{1}{3},2\right)$ (d) $\left(\frac{1}{3},1\right)$

55. Two side of a parallelogram are along lines $x+y=3$ and $x-y+3=0$. If its diagonals intersect at $(2,4)$, then one of its vertex is
(a) $(3,6)$ (b) $(2,6)$ (c) $(2,1)$ (d) $(3,5)$

56. The x co – ordinate of the incentre of the triangle that has the co – ordinates of mid – points of sides as $(0,1),(1,1)$ and $(1,0)$ is
(a) $2-\sqrt{2}$ (b) $1+\sqrt{2}$ (c) $1-\sqrt{2}$ (d) $2+\sqrt{2}$

57. If P and q are length of perpendiculars from origin to the lines $x\operatorname{cosec}\propto -y\sec\propto = k\cot 2\propto$ and $x\sin\propto +y\cos\propto = K\sin 2\propto$ respectively. Then $K^2$is equal to
(a) $2p^2+q^2$ (b) p^2+2q^2 (c) $4p^2+q^2$ (d) p^2+4q^2

58. The intersection of three lines $x-y=0, x+2y=3$ and $2x+y=6$ is a
(a) equilateral triangle (b) Right triangle
(c) Isosceles triangle (d) None of these

59. What is Locus of centroid of triangle whose vertices are $(a\cos t, a\sin t)$, $(b\sin t,-b\cos t)$ and $(1,0)$, where t is a parameter is
(a) $(3x+1)^2+(3y)^2=a^2+b^2$ (b) $(3x+1)^2+(3y)^2=a^2+b^2$

(c) $(3x+1)^2+(3y)^2=a^2-b^2$ (d) $(3x-1)^2+(3y)^2=a^2-b^2$

60. If $P(-1,0), Q(0,0)$ and $R(3,3\sqrt{3})$ be three points. Then equation of bisector of angle PQR is
(a) $\frac{\sqrt{3}}{2}x+y=0$ (b) $x+\sqrt{3}y=0$
(c) $\sqrt{3}x+y=0$ (d) $x+\frac{\sqrt{3}y}{2}=0$

61. If $\vec{a},\vec{b},\vec{c}$ are vectors such that $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}|=7, |\vec{b}|=5, |\vec{c}|=3$. Then angle between vectors $\vec{b}$ and $\vec{c}$ is
(a) $60°$ (b) $30°$ (c) $45°$ (d) $90°$

62. In ΔABC if $|\overrightarrow{BC}|=8, |\overrightarrow{CA}|=7, |\overrightarrow{AB}|=10$, then projection of vector $\overrightarrow{AB}$ on $\overrightarrow{AC}$ is equal to
(a) $25/4$ (b) $115/16$ (c) $127/20$ (d) $85/14$

63. Let $\vec{a}=3\hat{\imath}+2\hat{\jmath}+x\hat{k}$ and $\vec{b}=\hat{\imath}-\hat{\jmath}+\hat{k}$, for some real x. Then $|\vec{a}\times\vec{b}|=r$ is possible if
(a) $r\geq 5\sqrt{3/2}$ (b) $\sqrt{3/2}<r\leq 3\sqrt{3/2}$
(c) $3\sqrt{3/2}<r<5\sqrt{3/2}$ (d) None

64. If a, b and c are distinct positive numbers and vectors $a\hat{\imath}+a\hat{\jmath}+c\hat{k}, \hat{\imath}, +\hat{k}$, and $c\hat{\imath}+c\hat{\jmath}+b\hat{k}$ are coplanar, then c is equal to
(a) $\frac{a+b}{2}$ (b) $\frac{2ab}{a+b}$ (c) $\sqrt{ab}$ (d) None

65. If the volume of paralleopipe formed by vectors $\hat{\imath}+\lambda\hat{\jmath}+\hat{k}, \hat{\jmath}+\lambda\hat{k}$, and $\lambda\hat{\imath}+\hat{k}$ is minimum, then λ is equal to
(a) $-\sqrt{3}$ (b) $\sqrt{3}$ (c) $1/\sqrt{3}$ (d) $-\frac{1}{\sqrt{3}}$

66. The order and degree of differential equation $\left(1+\ 3\frac{dy}{dx}\right)^{2/3}=4\left(\frac{d^3y}{dx^3}\right)$ are
(a) $1, 2/3$ (b) $3, 1$ (c) $3, 3$ (d) $1, 2$

67. If $\frac{dy}{dx}+\frac{2^{x-y}\,(2^y-1)}{1-2^x}=0, x, y>0, y(1)=1$, then $(y(2))$ is equal to

(a) $2+\log_2^3$ (b) $2+\log_3^2$ (c) $2-\log_2^3$ (d) $2-\log_3^2$

68. The solution of equation $\frac{d^2y}{dx^2}=e^{-2x}$ is
(a) $\frac{e^{-2x}}{4}$ (b) $\frac{e^{-2x}}{4}+cx+d$ (c) $\frac{e^{-2x}}{4}+cx^2+d$ (d) $\frac{e^{-2x}}{4}+c+d$

69. If $(2+\sin x)\frac{dy}{dx}+(y+1)\cos x=0$ and $y(0)=1$, then $y\left(\frac{\pi}{2}\right)$ is equal to
(a) $-2/3$ (b) $-1/3$ (c) $4/3$ (d) $1/3$

70. The solution of differential equation $x\frac{dy}{dx}+2y=x^2(x\neq 0)$ and $y(1)=1$ is
(a) $y=\frac{x^2}{4}+\frac{3}{4x^2}$ (b) $y=\frac{3}{4}x^2+\frac{1}{4x^2}$ (c) $y=\frac{4x^3}{5}+\frac{1}{5x^2}$ (d) $y=\frac{x^3}{5}+\frac{1}{5x^2}$

71. If $\int\frac{(\cos x-\sin x)dx}{\sqrt{8-\sin 2x}}=a\sin^{-1}\left(\frac{\sin x+\cos x}{b}\right)+C$ then ordered pair (a,b) is
(a) $(1,-3)$ (b) $(3,1)$ (c) $(1,3)$ (d) $(-1,3)$

72. The value of $\int\frac{2x^3-1}{x^4+x}dx$ is
(a) $\log_e\frac{|x^3+1|}{x^2}+C$ (b) $\frac{1}{2}\log_e\frac{(x^3+1)^2}{|x^3|}+C$
(c) $\log_e\left|\frac{x^3+1}{x}\right|+C$ (d) None

73. If $\int x^5.e^{-4x^3}dx=\frac{1}{48}e^{-4x^3}.f(x)+C$, then $f(x)$ is equal to
(a) $-2x^3-1$ (b) $-4x^3-1$ (c) $-2x^3+1$ (d) $4x^3+1$

74. The value of $\int\frac{dx}{x^2(x^4+1)^{3/4}}$ is
(a) $-(x^4+1)^{\frac{1}{4}}+C$ (b) $-\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+C$
(c) $\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+C$ (d) None

75. The value of $\int_0^{\pi}\frac{e^{\cos x}\sin x\,dx}{(1+\cos^2 x)(e^{\cos x}+e^{-\cos x})}$ is equal to
(a) $\frac{\pi^2}{4}$ (b) $\frac{\pi^2}{2}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

76. The value of $\int_{-\pi/2}^{\pi/2} \frac{(1+\sin^2 x)}{1+\pi \sin x} dx$ is

(a) $\pi/2$ (b) $\frac{5\pi}{4}$ (c) $\frac{3\pi}{2}$ (d) $\frac{3\pi}{4}$

77. The value $\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}} \frac{dx}{1+\sqrt[3]{\tan 2x}}$ is equal to

(a) $\pi/6$ (b) $\pi/3$ (c) $\pi/12$ (d) $\pi/18$

78. The value of $\int_{-\pi}^{\pi} \left|\pi - |x|\right| dx$ is equal to

(a) $\sqrt{2}\pi^2$ (b) $2\pi^2$ (c) π^2 (d) $\pi^2/2$

79. The area of region bounded by $y - x = 2$ and $x^2 = y$ is equal to

(a) $2/3$ (b) $4/3$ (c) $9/2$ (d) $16/3$

80. The area of region bounded by the curve $y = |x-2|, x = 1, x = 3$ and the x – axis is

(a) 3 (b) 2 (c) 1 (d) 4

81. The value of $\underset{x \to 0}{\angle t} \frac{\sin^2(\pi \cos^4 x)}{x^4}$ is equal to

(a) $2\pi^2$ (b) π^2 (c) 4π (d) $4\pi^2$

82. If $\underset{x \to 0}{\angle t} \frac{\sin^{-1} x - \tan^{-1} x}{3x^3} = L$, then value of $(6L+1)$ is

(a) 2 (b) $1/2$ (c) $1/6$ (d) 6

83. If $\underset{x \to \infty}{\angle t} \left(a + \frac{a}{x} - \frac{4}{x^2}\right)^{2x} = e^3$ then value of a is

(a) 2 (b) $3/2$ (c) $1/2$ (d) $2/3$

84. If $f(1) = 1, f'(1) = 2$ then $\underset{x \to 1}{\angle t} \frac{\sqrt{f(x)}-1}{\sqrt{x}-1}$ is equal to

(a) 2 (b) 4 (c) 1 (d) $1/2$

85. If $f(x) = \begin{cases} \frac{\log_e(1+5x) - \log_e(l + \propto x)}{x} & \text{if } x \neq 0 \\ 10 & \text{if } x = 0 \end{cases}$ be continuous at $x = 0$ then $\propto$ is equal to

(a) 10 (b) -10 (c) 5 (d) -5

86. The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable is
(a) $(-\infty, 0) \cup (0, \infty)$ (b) $(-\infty, -1) \cup (-1, \infty)$
(c) $(-\infty, \infty)$ (d) $(0, \infty)$

87. If $x^k + y^k = a^k (a, k > 0)$ and $\frac{dy}{dx} + \left(\frac{y}{x}\right)^{1/3} = 0$, then K is
(a) $1/3$ (b) $3/2$ (c) $2/3$ (d) $4/3$

88. If $2y = \left[\cot^{-1}\left(\frac{\sqrt{3}\cos x + \sin x}{\cos x - \sqrt{3}\sin x}\right)\right]^2, x \in \left(0, \frac{\pi}{2}\right)$ then $\frac{dy}{dx}$ is equal to
(a) $\frac{\pi}{6} - x$ (b) $2x - \frac{\pi}{3}$ (c) $x - \frac{\pi}{6}$ (d) $\frac{\pi}{3} - x$

89. If $f(x) = \begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x^2 & 2x \\ \tan x & x & 1 \end{vmatrix}$, then $\underset{x \to 0}{\angle t} \frac{f'(x)}{x}$
(a) exists and equal to 0 (b) exists and equal to -2
(c) exists and equal to 2 (d) doesnot exists.

90. If f and g are differentiable functions in $[0,1]$ satisfying $f(0) = 2 = g(1), g(0) = 0$ and $f(1) = 6$ then for some $C \in (0,1)$
(a) $2f'(c) = 3\,g'(c)$ (b) $f'(c) = g'(c)$
(c) $f'(c) = 2g'(c)$ (d) $2f'(c) = g'(c)$

91. The surface area of cube is increasing at rate of $3.6\ cm^2/s$ retaining its shape. The rate of change of volume if length of side is 10cm, is
(a) $18\text{cm}^3/s$ (b) $10\ \text{cm}^3/s$ (c) $20\text{cm}^3/s$ (d) $9\text{cm}^3/s$

92. If the curves $\frac{x^2}{a} + \frac{y^2}{b} = 1$ and $\frac{x^2}{c} + \frac{y^2}{d} = 1$ intersect each other at an angle of $90°$, then
(a) $a - b = c - d$ (b) $a - c = b + d$
(c) $a + b = c + d$ (d) None

93. The function $f(x) = (3x - 7)\,x^{2/3}, x \in R$ is increasing for all x lying in
(a) $(-\infty, 0) \cup \left(\frac{14}{15}, \infty\right)$ (b) $(-\infty, 0) \cup \left(\frac{3}{7}, \infty\right)$
(c) $\left(-\infty, \frac{14}{15}\right)$ (d) $\left(-\infty, \frac{-14}{15}\right) \cup (0, \infty)$

94. The maximum volume of right circular cone having slant height 3cm is
(a) $2\sqrt{3}\,\pi m^3$ (b) $3\sqrt{3}\pi m^3$ (c) $6\pi\, m^3$ (d) $\frac{4}{3}\pi m^3$

95. A wire of length 2 units cut into two parts which are bent respectively to form a square of side x unit and a circle of radius r unit. If the sum of the areas of the square and the circle so formed is minimum, then
(a) $2x = (\pi + 4)r$ (b) $(4 - \pi)x = \pi r$
(c) $x = 2r$ (d) $2x = r$

96. If the number appeared on the two throws of a fair dice are $\propto$ and β. Then probability that $x^2 + \propto x + \beta > 0$, for all $x \in R$ is
(a) $17/36$ (b) $4/9$ (c) $1/2$ (d) $19/36$

97. Words with or without meaning are formed using all the letters of the word EXAMINATION. The probability that M appear at fourth position in any such words is
(a) $2/11$ (b) $1/11$ (c) $1/9$ (d) $1/66$

98. Let A and B are two events such that the probability that exactly one of them occurs is $2/5$ and the probability that A or B occurs is $1/2$. Then the probability of both of them occurs together is
(a) 0.10 (b) 0.20 (c) 0.01 (d) 0.02

99. Two integers are selected at random from set $\{1, 2, 3, \dots 11\}$. Given the sum of selected numbers is even, then conditional prob. that both the numbers are even is
(a) $7/10$ (b) $3/5$ (c) $2/5$ (d) $1/2$

100. In a class of 60 students 40 opted for NCC, 30 opted for NSS and 20 opted for both. If one of student is selected at random the probability that the student selected has opted neither NCC nor NSS is
(a) $1/6$ (b) $5/6$ (c) $1/3$ (d) $2/3$

101. Let A and B be two events such that $P\left(\overline{A \cup B}\right) = \frac{1}{6}, P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$. Then events A and B are
(a) Independent but not equally likely
(b) equally likely but not independent
(c) Both
(d) None of these

102. Let X have binomial distribution $B(n, p)$ such that sum and product of mean and variance are 24 and 128 respectively if $P(x > n - 3) = K/2^n$, then K is equal to
(a) 1528 (b) 529 (c) 629 (d) 630

103. The minimum number of times one has to toss a fair coin so that the probability of observing at least one head is at least 90% is
(a) 3 (b) 5 (c) 2 (d) 4

104. The number of values of $\propto$ for which system of equations $x + y + z = \propto, \propto x + 2 \propto y + 3z = -1, x + 3 \propto y + 5z = 4$ is in consistent is
(a) 0 (b) 1 (c) 2 (d) 3

105. If A is 3×3 matrix such that $|5. Adj\ A| = 5$, then $|A|$ is equal to
(a) $\pm\frac{1}{5}$ (b) ± 5 (c) ± 1 (d) $\pm\frac{1}{25}$

106. If $A^2 - A + I = 0$, then inverse of A is
(a) A (b) $A + I$ (c) $I - A$ (d) $A - I$

107. If $A = \begin{bmatrix} 2 & 2 \\ 9 & 4 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then $10A^{-1}$ is equal to
(a) $6I - A$ (b) $A - 6I$ (c) $4I - A$ (d) $A - 4I$

108. Let A and B be two 3×3 matrices such that $AB = I$ and $|A| = \frac{1}{8}$ then $\left|Adj\left(3\ adj(2A)\right)\right|$ is equal to
(a) 16 (b) 32 (c) 64 (d) 128

109. The least value of product of x, y and z for which $\begin{vmatrix} x & 1 & 1 \\ 1 & y & 1 \\ 1 & 1 & z \end{vmatrix}$ is non negative is
(a) $-2\sqrt{2}$ (b) $-16\sqrt{2}$ (c) -8 (d) -1

110. If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = ax - 12$, then a is equal to
(a) 12 (b) 24 (c) – 12 (d) – 24

111. The mean of numbers $a, b, 8, 5, 10$ is 6 and the variance is 6.80. Then value of a and b are
(a) 3, 4 (b) 0, 7 (c) 5, 2 (d) 1, 6

112. All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which one of the following will not change?
(a) Median (b) Mode (c) Variance (d) Mean

113. If $\sum_{i=1}^{n}(x_i - a) = n$ and $\sum_{i=1}^{n}(x_i - a)^2 = na\ (n, a > 1)$ then standard deviation of n observation is
(a) $a - 1$ (b) $n\sqrt{a-1}$ (c) $\sqrt{n\,(a-1)}$ (d) $\sqrt{a-1}$

114. The mean and variance of 7 observations are 8 and 16 respectively. If two observation are 6 and 8, then variance of remaining 5 observations is
(a) $92/5$ (b) $134/5$ (c) $112/5$ (d) $536/25$

115. The sum of deviations of 50 observations from 30 is 50. Then mean of 50 observations is
(a) 30 (b) 51 (c) 31 (d) 50

116. The mean of 10 numbers $7 \times 8, 10 \times 10, 13 \times 12 \ldots$ is
(a) 398 (b) 400 (c) 200 (d) 100

117. The average marks of boys in class is 52 and that of girls is 42. The average marks of whole class is 50. Then percentage of boys in the class is
(a) 80% (b) 60% (c) 40% (d) 20%

118. In a frequency distribution mean and median are 21 and 22 respectively, then mode is
(a) 20.5 (b) 22 (c) 24 (d) 25.5

119. If median of 19 observations is 30. Two observation 8 and 32 are included, the mean of 21 observations will be
(a) 30 (b) 32 (c) 28 (d) None

120. If two regression lines are $2x + 3y = 5$ and $3x + 4y = 7$, then what are values of $\overline{x}$ and $\overline{y}$?
(a) 2, 3 (b) 3, 4 (c) 1, 1 (d) 5, 6