DEPARTMENT OF EDUCATION
CENTRAL TIBETAN ADMINISTRATION, DHARAMSHALA
ENTRANCE EXAMINATION-2011.

MATHEMATICS

Time : 2 hours **Max. Marks 100.**

INSTRUCTIONS:

There are hundred questions in this paper. All the questions are of Multiple Choice type and carry equal marks. Each question is followed by four responses marked **(a)**, **(b)**, **(c)** and **(d)**. Select the one, which is the best in each case and record it clearly against the question number on the answer sheets provided with the paper.

More than one response indicated against an item or overwriting in the answer sheet would deem as incorrect response and no mark will be granted on that.

Question paper along with the answer sheet of the paper should be returned to the invigilator after the completion of the paper or when the time is over whichever is earlier.

Roll No.________________________

Marks obtained by the candidate:

____

Signature of Examiner

MATHEMATICS-2011

Q.1. If $b > a$, then the equation $(x-a)(x-b)-1=0$, has:

(a) both roots in [a, b]

(b) both roots in $(-\infty, a)$

(c) both roots in $(b, +\infty)$

(d) one root in $(-\infty, a)$ and other in $(b, +\infty)$

Q.2. The normals at three points *P, Q, R* of the parabola $y^2 = 4ax$ meet in (*h,k*). The centroid of triangle lies on:

(a) $x = 0$ (b) $y = 0$

(c) $x = -a$ (d) $y = a$

Q.3. If the system of equations $x - ky - z = 0$, $kx - y - z = 0$, $x + y - z = 0$ has a non-zero solution, then the possible values of *k* are:

(a) – 1, 2 (b) 1, 2

(c) 0, 1 (d) – 1, 1

Q.4. The value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ (where a, b and c being positive real numbers) is:

(a) positive (b) negative

(c) non-negative (d) non-positive

Q.5. Let *AB* be a chord of the circle $x^2 + y^2 = r^2$ subtending a right angle at the centre. Then the locus of the centroid of the triangle *PAB* as *P* moves on the circle is:

(a) a parabola (b) a circle

(c) an ellipse (d) a pair of straight lines

Q.6. If *AB=A* and *BA=B*, where *A* and *B* are square matrices, then:

(a) $B^2 = B$ and $A^2 = A$ (b) $B^2 = A$ and $A^2 = B$

(c) *AB=BA* (d) none of these

Q.7. In the binomial expansion of $(a-b)^n$, $n \geq 5$, then the sum of 5th and 6th terms is zero. Then $\frac{a}{b}$ equals:

(a) $\frac{n-5}{6}$ (b) $\frac{n-4}{5}$

(c) $\frac{5}{n-4}$ (d) $\frac{6}{n-5}$

Q.8. A stone is dropped from an aeroplane which is rising with acceleration $5\,ms^{-2}$. If the acceleration of the stone relative to the aeroplane by f, then the following is true (assuming $g = 10ms^{-2}$)

(a) $f = 5ms^{-2}$ downward (b) $f = 5ms^{-2}$ upward

(c) $f = 15ms^{-2}$ upward (d) $f = 15ms^{-2}$ downward

Q.9. A train weighting W tons is moving with an acceleration f ft/sec^2. When a carriage of wight w tons is suddenly detached from it. Then, the change in the acceleration of train is:

(a) $\frac{Wf}{W-w}$ ft/sec^2 (b) $\frac{W}{W-w}$ ft/sec^2

(c) $\frac{wf}{W-w}$ ft/sec^2 (d) $\frac{w}{W-w}$ ft/sec^2

Q.10. A rough plane is inclined at an angle of 45^0 to the horizontal. A horizontal force of magnitude 4 kg wt applied on a body is enough to sustain a body from falling down the inclined plane. If the coefficient of friction is 0.5, the weight of body can be:

(a) 17 kg (b) 19 kg

(c) 10 kg (d) 15 kg

Q.11. A stone is projected so that its horizontal range is maximum and equal to 80 feet. Its time of flight and the height through it rises are $(g = 32ft/s^2)$

(a) $\sqrt{5}$ sec, 20 ft (b) 2 sec, 10 ft

(c) $\sqrt{3}$ sec, 0 ft (d) 2 sec, 20 ft

Q12. If ${}^{n}C_{r-1} = 36$, ${}^{n}C_{r} = 84$ and ${}^{n}C_{r+1} = 126$, then r is equal to

(a) 1 (b) 2

(c) 3 (d) 4

Q.13. If z_1, z_2, z_3 are vertices of an equilateral triangle with z_0 centroid, then $z_1^2 + z_2^2 + z_3^2$ is equal to:

(a) z_0^2 (b) 9 z_0^2

(c) 3 z_0^2 (d) 2 z_0^2

Q.14. The number of real solutions of equation $|x|^2 - 3|x| + 2 = 0$ is:

(a) 4 (b) 1

(c) 3 (d) 2

Q.15. If *a* and *d* are two complex numbers, then the sum to (n+1) terms of the series $aC_0 - (a+d)C_1 + (a+2d)C_2 - (a+3d)C_3 + ...$ is:

(a) $\frac{a}{2^n}$ (b) *na*

(c) 0 (d) $a^2 n^2$

Q.16. The number of ways in which one or more balls can selected out of 10 white, 9 green and 7 blue balls is:

(a) 892 (b) 881

(c) 891 (d) 879

Q.17. Coefficient of $x^{14} y^{14} z^{12}$ in $\left(x^2 + y + z^3\right)^{40}$ is:

(a) $\frac{40!}{14!14!12!}$ (b) 0

(c) $\frac{40!}{7!14!4!}$ (d) none of these

Q.18. The integer k for which the inequality $x^2 - 2(4k-1)x + 15k^2 - 2k - 7 > 0$ is valid for any real x, is:

(a) 2 (b) 3

(c) 4 (d) 1

Q.19. 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) $a = 25, b = 16$

(c) $a = 5, b = 4$ (d) $a = 5, b = 8$

Q.20. If z_1, z_2 are two non zero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$, then $amp\left(\frac{z_1}{z_2}\right)$ is equal to:

(a) π (b) $-\pi$

(c) 0 (d) $\frac{\pi}{2}$

Q.21. If $z_r = \cos\frac{2r\pi}{5} + i\sin\frac{2r\pi}{5}$, $r = 0,1,2,3,4,...$ then $z_1 z_2 z_3 z_4 z_5$ is equal to:

(a) – 1 (b) 0

(c) 1 (d) 2

Q.22. The number of terms in the expansion of $\left(1 + 3x + 3x^2 + x^3\right)^6$ is:

(a) 18 (b) 9

(c) 19 (d) 24

Q.23. The largest term in the expansion of $(3 + 2x)^{50}$, where $x = \frac{1}{5}$ is:

(a) 5th (b) 4th

(c) 6th (d) 7th

Q.24. The term independent of x in the expansion of $\left(x^3 - \frac{1}{x^2}\right)^5$ is:

(a) – 10 (b) 10

(c) – 20 (d) 20

Q.25. If the A.M. and G.M. between two numbers are in the ratio $m:n$, then the numbers are in the ratio:

(a) $m+\sqrt{n^2-m^2}:m-\sqrt{n^2-m^2}$ (b) $m+\sqrt{m^2+n^2}:m-\sqrt{m^2+n^2}$

(c) $m+\sqrt{m^2-n^2}:m-\sqrt{m^2-n^2}$ (d) $m-\sqrt{m^2+n^2}:m+\sqrt{m^2-n^2}$

Q.26. If $\frac{1}{b+c},\frac{1}{c+a},\frac{1}{a+b}$ are in A.P., then:

(a) a,b,c are in A.P. (b) a^2,b^2,c^2 are in A.P.

(c) $\frac{1}{a},\frac{1}{b},\frac{1}{c}$ are in A.P. (d) $\frac{1}{a^2},\frac{1}{b^2},\frac{1}{c^2}$ are in A.P.

Q.27. Area of a circle in which a chord of length $\sqrt{2}$ makes an angle $\frac{\pi}{2}$ at the centre is:

(a) $\frac{\pi}{2}$ (b) 2π

(c) π (d) $\pi/4$

Q.28. A line drawn through a fixed point $P(\alpha,\beta)$ to cut the circle $x^2+y^2=r^2$ at A and B, then $PA\times PB$ is equal to:

(a) $(\alpha+\beta)^2-r^2$ (b) $\alpha^2+\beta^2-r^2$

(c) $(\alpha-\beta)^2+r^2$ (d) $\alpha^2-\beta^2+r^2$

Q.29. The condition that the chord $x\cos\alpha+y\sin\alpha-p=0$ of $x^2+y^2-a^2=0$ may subtend a right angle at the centre of the circle is:

(a) $a^2=2p^2$ (b) $p^2=2a^2$

(c) $a=2p$ (d) $p=2a$

Q.30. If $P\left(at_1^2,2at_1\right)$ and $Q\left(at_1^2,2at_2\right)$ are two variable points on the curve $y^2=4ax$ and PQ subtends a right angle at the vertex, then t_1t_2 is equal to:

(a) – 1 (b) – 2

(c) – 3 (d) – 4

Q.31. Two tangents are drawn from the point $(-2,-1)$ to the parabola $y^2 = 4x$. If α is the angle between these tangents, then tan α is equal to:

(a) 3 (b) 1 / 3

(c) 2 (d) 1 / 2

Q.32. The two points on the line $x+y=4$ that lie at a unit distance from the line $4x+3y=10$ are:

(a) $(-3,1),(7,11)$ (b) $(3,1),(-7,11)$

(c) $(3,1),(7,11)$ (d) $(3,1),(1,1)$

Q.33. The image of the point (3,8) in the line $x+3y=7$ is:

(a) (4,7) (b) (2,3)

(c) $(-1,-4)$ (d) (4,3)

Q.34. The equation of ellipse in the form $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, given the eccentricity to be $\frac{2}{3}$ and latus rectum $\frac{2}{3}$, is:

(a) $25x^2+45y^2=9$ (b) $125x^2+9y^2=45$

(c) $25x^2-45y^2=9$ (d) $9x^2-125y^2=45$

Q.35. If for a hyperbola eccentricity is $\sqrt{3}$, the distance between foci is 9, then the equation of the hyperbola in the standard form is:

(a) $\frac{x^2}{\left(\frac{3\sqrt{3}}{2}\right)^2}-\frac{y^2}{\left(\frac{3\sqrt{3}}{\sqrt{2}}\right)^2}=1$ (b) $\frac{x^2}{\left(\frac{3\sqrt{3}}{2}\right)^2}-\frac{y^2}{\left(\frac{3\sqrt{3}}{2}\right)^2}=1$

(c) $\frac{x^2}{9}-\frac{y^2}{4}=1$ (d) $\frac{x^2}{\left(\frac{3\sqrt{3}}{\sqrt{2}}\right)^2}-\frac{y^2}{\left(\frac{3\sqrt{3}}{\sqrt{2}}\right)^2}=1$

Q.36. If $m\tan\left(\theta-30^0\right)=n\tan\left(\theta+120^0\right)$, then the value of $\frac{(m+n)}{2(m-n)}$ is:

(a) $\tan 2\theta$ (b) $\cos 2\theta$

(c) $\sin 2\theta$ (d) $\tan^2\theta$

Q.37. If $\tan\theta=a/b$, then $a\sin 2\theta+b\cos 2\theta$ is equal to:

(a) a (b) b

(c) $\frac{b}{a}$ (d) $\frac{a+b}{b}$

Q.38. If $\cot\frac{A}{2}=\frac{b+c}{a}$, then the ΔABC is:

(a) isosceles (b) equilateral

(c) right angled (d) none of these

Q.39. If $\sin^{-1}x+\sin^{-1}y=\frac{2\pi}{3}$, then $\cos^{-1}x+\cos^{-1}y$ is equal to:

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{3}$

(c) $\pi/6$ (d) π

Q.40. The number of solutions of $16^{\sin^2 x}+16^{\cos^2 x}=0$, $0\le x\le 2\pi$, is:

(a) 8 (b) 6

(c) 4 (d) 2

Q.41. If an a ΔABC, $\angle B=60^0$, then:

(a) $(a-b)^2=c^2-ab$ (b) $(b-c)^2=a^2-bc$

(c) $(c+a)^2=b^2-ac$ (d) $a^2+b^2+c^2=2b^2+ac$

Q.42. Number of common tangents to the circles $x^2+y^2-2x+4y+4=0$ and $x^2+y^2-4x+2y+4=0$ is:

(a) 2 (b) 4

(c) 3 (d) no common tangent

Q.43. The function $f(x)=[x]\cos\left(\frac{2x-1}{2}\right)\pi$, where $[\bullet]$ denotes the greatest integer function, is discontinuous at:

(a) all x (b) all integer points

(c) no x (d) all non-integer points

Q.44. The equation of the tangent to the curve $y=1-e^{x/2}$ at the point of intersection with the $y-axis$, is:

(a) $x+2y=0$ (b) $2x+y=0$

(c) $x-y=0$ (d) $x+y=0$

Q.45. $\int \cos^3 x e^{\ln(\sin x)} dx$ equals:

(a) $-\frac{\sin^4 x}{4}+c$ (b) $-\frac{\cos^4 x}{4}+c$

(c) $\frac{e^{\sin x}}{4}+c$ (d) $\frac{e^{\cos x}}{4}+c$

Q.46. If $\int \frac{\cos 4x+1}{\cot x-\tan x} dx = A\cos 4x+B$, then:

(a) $A=-\frac{1}{2}$ (b) $A=-\frac{1}{8}$

(c) $B=\frac{1}{3}$ (d) $B=\frac{2}{3}$

Q.47. The value of $\int_{-\pi/3}^{\pi/3} \frac{x\sin x}{\cos^2 x} dx$ is:

(a) $\left(\frac{\pi}{3}-\log\tan\frac{3\pi}{2}\right)$

(b) $2\left(\frac{2\pi}{3}-\log\tan\frac{5\pi}{12}\right)$

(c) $3\left(\frac{\pi}{2}-\log\sin\frac{\pi}{12}\right)$

(d) none of these

Q.48. The value of $\int_0^{1000} e^{x-[x]}dx$ is (where $[\bullet]$ denotes the greatest integer function)

(a) $\frac{e^{1000}-1}{1000}$ (b) $\frac{e^{1000}-1}{e-1}$

(c) $1000(e-1)$ (d) $\frac{e-1}{1000}$

Q.49. The value of $\lim\limits_{x\to 1}\frac{x+x^2+...+x^n-n}{x-1}$ is $(n\in N)$:

(a) n (b) $\frac{n+1}{2}$

(c) $\frac{n(n+1)}{2}$ (d) $\frac{n(n-1)}{2}$

Q.50. On the interval [0,1] the function $x^{25}(1-x)^{75}$ takes its maximum value at the point

(a) 0 (b) 1 / 4

(c) 1 / 2 (d) 1 / 3

Q.51. The value of $\int_{-\pi}^{\pi}\frac{\cos^2 x}{1+a^x}dx,(a>0)$ is equal to:

(a) π (b) $\frac{\pi}{2}$

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{3}$

Q.52. If $y=\tan^{-1}\left(\frac{1}{x^2+x+1}\right)+\tan^{-1}\left(\frac{1}{x^2+3x+3}\right)+\tan^{-1}\left(\frac{1}{x^2+5x+7}\right)$

$+\tan^{-1}\left(\frac{1}{x^2+7x+13}\right)+...+$ up to n terms then $y'(0)$ is equal to:

(a) $-\frac{1}{1+n^2}$ (b) $-\frac{n^2}{1+n^2}$

(c) $\frac{n}{1+n^2}$ (d) $-\frac{n}{1+n^2}$

Q.53. If the probability of *A* to fail in an examination is $\frac{1}{5}$ and that of *B* is $\frac{3}{10}$, then the probability that atleast one of *A* and *B* fails is:

(a) $\frac{1}{2}$ (b) $\frac{11}{25}$

(c) $\frac{19}{50}$ (d) $\frac{13}{25}$

Q.54. The differential equation $\frac{dy}{dx}+\frac{9x}{4y}=0$ represents a family of:

(a) parallel straight lines whose slope is $\tan^{-1}\frac{3}{2}$

(b) concentric circle with center at (3,2)

(c) ellipse with eccentricity $\frac{\sqrt{5}}{3}$

(d) hyperbolas with eccentricity $\frac{\sqrt{5}}{2}$

Q.55. The area bounded by the curves $y=|x|-1$ and $y=-|x|+1$, in sq. units, is:

(a) 2 (b) 1

(c) $2\sqrt{2}$ (d) 4

Q.56. If $\begin{vmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{vmatrix}=0$, then:

(a) $\frac{a}{b}$ is one of the cube roots of unity

(b) a is one of the cube roots of unity

(c) b is one of the cube roots of unity

(d) $\frac{a}{b}$ is one of the cube root of – 1

Q.57. The value of determinant $\begin{vmatrix} 1 & 1 & 1 \\ {}^{m}C_1 & {}^{m+1}C_1 & {}^{m+2}C_1 \\ {}^{m}C_2 & {}^{m+1}C_2 & {}^{m+2}C_2 \end{vmatrix}$ is equal to:

(a) 1 (b) – 1

(c) 0 (d) m^2

Q.58. Given two vectors $\hat{i}-\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}-2\hat{k}$, the unit vector coplanar with these vectors and perpendicular to the first is:

(a) $\left(\frac{1}{\sqrt{6}}\right)\left(\hat{i}+2\hat{j}-2\hat{k}\right)$ (b) $\left(\frac{1}{\sqrt{5}}\right)\left(2\hat{i}+\hat{j}\right)$

(c) $\left(\frac{1}{\sqrt{2}}\right)\left(\hat{i}+\hat{k}\right)$ (d) $\frac{-4\hat{i}+\hat{j}-\hat{k}}{3\sqrt{2}}$

Q.59. $\left[\vec{a}\ \vec{b}\ \hat{i}\right]\hat{i}+\left[\vec{a}\ \vec{b}\ \hat{j}\right]\hat{j}+\left[\vec{a}\ \vec{b}\ \hat{k}\right]\hat{k}$ is equal to:

(a) $\vec{a}+\vec{b}$ (b) $\vec{a}-\vec{b}$

(c) $\vec{a}\times\vec{b}$ (d) $\vec{b}\times\vec{a}$

Q.60. If the system of equations $x+4ay+az=0$, $x+3by+bz=0$ and $x+2cy+cz=0$ has a non-trivial solution, then a,b and c are in:

(a) A.P. (b) G.P.

(c) H.P. (d) none of these

Q.61. Area bounded by the curve $y=\ln x$, $y=0$ and $x=e$ in sq. units is given by:

(a) e (b) $\frac{e}{2}$

(c) 1 (d) $-e$

Q.62. The order of the differential equation whose general solution is given by $y=\left(c_1+c_2\right)\cos x-c_3e^{x+c_4}+c_5$, where c_1,c_2,c_3,c_4 and c_5 are arbitrary constants, is:

(a) 5 (b) 4

(c) 3 (d) none of these

Q.63. If $A(\alpha)=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$, then $A(\alpha)A(\beta)$ equals:

(a) $A(\alpha+\beta)$

(b) $A(\alpha-\beta)$

(c) $A(\beta-\alpha)$

(d) none of these

Q.64. A boy is throwing stones at a target. The probability of hitting the target at any trial is $\frac{1}{2}$. The probability of hitting the target 5th time at the 10th throw is:

(a) $\frac{{}^{9}C_{4}}{2^{10}}$

(b) $\frac{{}^{8}C_{3}}{2^{10}}$

(c) $\frac{{}^{10}C_{5}}{2^{10}}$

(d) none of these

Q.65. The area of the figure bounded by the lines $x=0, x=\frac{\pi}{2}, y=0, f(x)=\sin x$ and $g(x)=\cos x$ is:

(a) $2(\sqrt{2}-1)$

(b) $\sqrt{3}-1$

(c) $2(\sqrt{3}-1)$

(d) none of these

Q.66. The mean and variance of a binomial variate X are 2 and 1 respectively. The probability that X takes a value greater than 1 is:

(a) $\frac{1}{16}$

(b) $\frac{5}{16}$

(c) $\frac{11}{16}$

(d) $\frac{15}{16}$

Q.67. Let $g(x)$ be the inverse of the function $f(x)$ and $f'(x)=\frac{1}{1+x^3}$. Then $g'(x)$ is:

(a) $\frac{1}{1+(g(x))^3}$

(b) $\frac{1}{1+(f(x))^3}$

(c) $1+(g(x))^3$.

(d) $1+(f(x))^3$

Q.68. How many different arrangements can be made out of the letters in the expansion $A^2B^3c^4$, when written in full?

(a) $\frac{9!}{2!3!4!}$ (b) $2!+3!+4!(2!+3!+4!)$

(c) $2!3!-4!$ (d) $\frac{9!}{2!+3!+4!}$

Q.69. If y_1, y_2 and y_3 are the ordinates of the vertices of a triangle inscribed in the parabola $y^2 = 4ax$. Then its area is:

(a) $\frac{1}{2a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$ (b) $\frac{1}{4a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$

(c) $\frac{1}{8a}(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)$ (d) none of these

Q.70. The equation of the plane passing through the point $(1,2-1)$ and parallel to the plane $3x - y + 4z = 7$ is:

(a) $3x - y + 4z + 3 = 0$ (b) $3x - y + 4z = 5$

(c) $3x - y + 4z = 3$ (d) $6x - 2y + 8z = 0$

Q.71. If the sum of the coefficients in the expansion of $\left(\alpha^2x^2 - 2\alpha x + 1\right)^{51}$ vanishes, then the value of α is:

(a) 2 (b) – 1

(c) 1 (d) – 2

Q.72. If α, β are the roots of the equation $x^2 + x + 3 = 0$, then the equation $3x^2 + 5x + 3 = 0$ has roots:

(a) $\frac{\alpha}{\beta}, \frac{\beta}{\alpha}$ (b) $\left(\frac{\beta}{\alpha}\right), 1$

(c) $\frac{\alpha}{\beta}, -\frac{\beta}{\alpha}$ (d) none of these

Q.73. I the coefficients of x^6 and x^5 in the expansion of $\left(3+\frac{x}{4}\right)^n$ are equal, then n is equal to:

(a) 17 (b) 47

(c) 77 (d) 67

Q.74. If a,b and c are in G.P., then for some real number $\alpha, a+\alpha, b+\alpha$ and $c+\alpha$ are always in:

(a) A.P. (b) G.P.

(c) H.P. (d) none of these

Q.75. The least velocity with which a cricket ball can be thrown 20 meters is:

(a) 10 m/sec (b) 14 m/sec

(c) 21 m/sec (d) 7 m/sec

Q.76. A balloon is pumped at the rate of $a\ cm^2$/minute. The rate of increases of its surface area, when the radius is b cm, is:

(a) $\frac{2a^2}{b^4} cm^2/\min$ (b) $\frac{a}{2b} cm^2/\min$

(c) $\frac{2a}{b} cm^2/\min$ (d) none of these

Q.77. The vectors $2\hat{i}-m\hat{j}+3m\hat{k}$ and $(1+m)\hat{i}-2m\hat{j}+\hat{k}$ include an acute angle for:

(a) all real m (b) $m<-2$ or $m>-\frac{1}{2}$

(c) $m=-\frac{1}{2}$ (d) $m\in\left[-2,-\frac{1}{2}\right]$

Q.78. If $y=\sqrt{\left(\frac{1+\cos 2\theta}{1-\cos 2\theta}\right)}$, then $\frac{dy}{d\theta}$ at $\theta=\frac{3\pi}{4}$ is:

(a) – 2 (b) 2

(c) ± 2 (d) none of these

Q.79. The solution of differential equation $\frac{dy}{dx} + ay = e^{mx}$ is:

(a) $(a+m)y = e^{mx} + c$

(b) $ye^{mx} = me^{mx} + c$

(c) $y = e^{mx} + ce^{-ax}$

(d) $(a+m)y = e^{mx} + ce^{-ax}$

Q.80. If $\vec{a} = \hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 3\hat{i} + p\hat{j} + 5\hat{k}$ are coplanar, then p is equal to:

(a) 6

(b) – 6

(c) 2

(d) – 2

Q.81. From 4 children, 2 women and 4 men a group of 4 is selected. The probability that there are exactly 2 children among the selected is:

(a) $\frac{11}{21}$

(b) $\frac{9}{21}$

(c) $\frac{10}{21}$

(d) none of these

Q.82. A fair coin is tossed repeatedly. If tail appears on first four tosses, then the probability of head appearing on fifth toss equals:

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

(b) $\frac{1}{32}$

(c) $\frac{31}{32}$

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

Q.83. If $\Delta = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then Δ is equal to:

(a) $4abc$

(b) abc

(c) 0

(d) none of these

Q.84. If the angles of a triangle are in the ratio 1 : 2 : 3, then the corresponding sides are in the ratio:

(a) 2 : 3 : 1

(b) $\sqrt{3}$: 2 : 1

(c) 2 : $\sqrt{3}$: 1

(d) 1 : $\sqrt{3}$: 2

Q.85. The radius of circumscribing circle of a regular polygon of n sides each of length a is:

(a) $2a\operatorname{cosec}\left(\frac{\pi}{n}\right)$ (b) $a\operatorname{cosec}\left(\frac{2\pi}{n}\right)$

(c) $\frac{a}{2}\operatorname{cosec}\left(\frac{\pi}{n}\right)$ (d) none of these

Q.86. A man from the top of a 100 meters high tower sees a car moving towards the tower at an angle of depression 30^0. After some time, the angle of depression becomes 60^0. The distance (in meters) travelled by the car during this time is:

(a) $100\sqrt{3}$ (b) $200\frac{\sqrt{3}}{3}$

(c) $100\frac{\sqrt{3}}{3}$ (d) $200\sqrt{3}$

Q.87. The equation of the circle which has two normal's $(x-1)(y-2)=0$ and a tangent $3x+4y=6$ is:

(a) $x^2+y^2-2x-4y+4=0$ (b) $x^2+y^2+2x-4y+5=0$

(c) $x^2+y^2=5$ (d) $(x-3)^2+(y-4)^2=5$

Q.88. The circles $x^2+y^2-10x+16=0$ and $x^2+y^2=r^2$ intersect each other in two distinct points, if:

(a) $r<2$ (b) $r>8$

(c) $2<r<8$ (d) $2\le r\le 8$

Q.89. If circles $x^2+y^2+2x+2ky+6=0$ and $x^2+y^2+2ky+k=0$ intersect orthogonally, then k is:

(a) 2 or $\frac{-3}{2}$ (b) – 2 or $\frac{-3}{2}$

(c) 2 or $\frac{3}{2}$ (d) – 2 or $\frac{3}{2}$

Q.90. The equation of a parabola whose focus is $(-3,0)$ and directrix is $x+5=0$, is:

(a) $x^2=4(y-4)$ (b) $x^2=4(y+5)$

(c) $y^2=4(x-4)$ (d) $y^2=4(x+4)$

Q.91. Axis of the parabola $x^2-3y-6x+6=0$ is:

(a) $x=-3$ (b) $y=-1$

(c) $x=3$ (d) $y=1$

Q.92. The sum of the focal distance from any point on the ellipse $9x^2+16y^2=144$ is:

(a) 32 (b) 18

(c) 16 (d) 8

Q.93. The equation of tangent to the ellipse $x^2+3y^2=3$ which is perpendicular to the line $4y=x-5$ is:

(a) $4x+y+7=0$ (b) $4x+y+3=0$

(c) $4x+y-3=0$ (d) none of these

Q.94. Equation of the tangent to the hyperbola $2x^2-3y^2=6$ which is parallel to the line $y=3x+4$ is:

(a) $y=3x+5$ (b) $y=3x-5$

(c) $y=3x+5$ and $y=3x-5$ (d) none of these

Q.95. The term independent of *x* in expansion of $\left(x^2-\frac{1}{3x}\right)^9$ is equal to:

(a) $\frac{28}{81}$ (b) $\frac{28}{243}$

(c) $-\frac{28}{243}$ (d) $-\frac{28}{81}$

Q.96. If $A=\begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is symmetric, then *x* is equal to:

(a) 3 (b) 5

(c) 2 (d) 4

Q.97. If $\frac{|z-2|}{|z-3|}=2$ represents a circle, then its radius is:

(a) 1 (b) 1 / 3

(c) 3 / 4 (d) 2 / 3

Q.98. The total number of arrangements which can be made out of the letters of the word ALGEBRA without altering the relative position of vowels and consonants is:

(a) $\frac{7!}{2!}$ (b) $\frac{7}{2!5!}$

(c) 4! 3! (d) $\frac{4!3!}{2}$

Q.99. Area bounded by the curve $xy^2=a^2(a-x)$ and y-axis is:

(a) $\frac{\pi a^2}{2}$ (b) πa^2

(c) $3\pi a^2$ (d) none of these

Q.100. The equation at the plane containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$ and the point $(0,7,-7)$ is:

(a) $x+y+z=1$ (b) $x+y+2=2$

(c) $x+y+2=0$ (d) $x+y+z=7$

<><><><><><><><><><><><><><><><>

DEPARTMENT OF EDUCATION
CENTRAL TIBETAN ADMINISTRATION, DHARAMSHALA
ENTRANCE EXAMINATION-2011.

ANSWER SHEET FOR	**Name**	
MATHEMATICS	**Roll No.**	

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1		2		3		4		5	
6		7		8		9		10	
11		12		13		14		15	
16		17		18		19		20	
21		22		23		24		25	
26		27		28		29		30	
31		32		33		34		35	
36		37		38		39		40	
41		42		43		44		45	
46		47		48		49		50	
51		52		53		54		55	
56		57		58		59		60	
61		62		63		64		65	
66		67		68		69		70	
71		72		73		74		75	
76		77		78		79		80	
81		82		83		84		85	
86		87		88		89		90	
91		92		93		94		95	
96		97		98		99		100	