TARGET MATHEMATICS
THE EXCELLENCE KEY
AGYAT GUPTA (M.Sc., M.Phil.)

26 YEARS of quality education

CODE:2101- AG-6 **REGNO:-TMC -D/79/89/36/63**

General Instructions :-

(i) **All** Question are compulsory :

(ii) This question paper contains **29** questions.

(iii) Question **1-4** in **Section A** are very sort-answer type question carrying **1** mark each.

(iv) Question **5-12**in **Section B** are sort-answer type question carrying **2** mark each.

(v) Question **13-23** in **Section C** are long-answer-**I** type question carrying **4** mark each.

(vi) Question **24-29** in **Section D** are long-answer-**II** type question carrying **6** mark each

(vii) There is no overall choice. However, internal choice has been provided in 3 question of four marks and 3 questions of six marks each. You have to attempt only one If the alternatives in all such questions.

(viii) Use of calculator is not permitted.

(ix) Please check that this question paper contains 6 printed pages.

(x) Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

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PRE-BOARD EXAMINATION 2017 -18

Time : 3 Hours Maximum Marks : 100

CLASS – XII **CBSE** **MATHEMATICS**

Q.1	Write the number of all possible matrices of order 2×2 with each entry 0 or 1 and whose determinant is positive.
Q.2	Find λ when the projection of $\hat{i}+\lambda\hat{j}+\hat{k}$ on $\hat{i}+\hat{j}$ is $\sqrt{2}$ units.
Q.3	Let relation $R=\{(x,y)\in w\times w : y=2x-4\}$. If $(4,b^2)$ belong to relation R, find the value of b .
Q.4	If $f:R\to R$ is defined by $f(x)=\dfrac{x}{x^2+1}$, find $f(f(2))$
	PART – B **(Question 5 to 12 carry 2 mark each.)**
Q.5	Solve the following equation : $3\sin^{-1}\dfrac{2x}{1+x^2}-4\cos^{-1}\dfrac{1-x^2}{1+x^2}+2\tan^{-1}\dfrac{2x}{1-x^2}=\dfrac{\pi}{3}$.
Q.6	Two cards are drawn without replacement from a well shuffled pack of 52 cards. Find the probability that one is a king and other is a queen of opposite color.
Q.7	Find the integrating factor for the linear differential equation : $(y^2-1)+2xy\dfrac{dy}{dx}=\left(\dfrac{2}{y^2-1}\right)\dfrac{dy}{dx}$.
Q.8	Find the matrix X for which $\begin{bmatrix}2 & -1\\ 3 & 4\end{bmatrix}X=\begin{bmatrix}3 & 0\\ 43 & 22\end{bmatrix}$.
Q.9	Evaluate: $\int\dfrac{\sqrt{x^2+1}\left[\log(x^2+1)-2\log x\right]}{x^4}dx$.
Q.10	The side of an equilateral triangle increases at the uniform rate of 2

	cm/sec. find the rate of increase in the area of the triangle when the side is 20 cm.
Q.11	If $a > b > c > 0$, prove that $\cot^{-1}\left(\frac{1+ab}{a-b}\right)+\cot^{-1}\left(\frac{1+bc}{b-c}\right)+\cot^{-1}\left(\frac{1+ca}{c-a}\right)=\pi$.
Q.12	If $\hat{a}, \hat{b}$ and $\hat{c}$ are mutually perpendicular unit vectors, then find the value of $\lvert 2\hat{a}+\hat{b}+\hat{c}\rvert$.
	PART – C **(Question 13 to 23 carry 4 mark each.)**
Q.13	Evaluate : $\int (2\sin 2x-\cos x)\left(\sqrt{6-\cos^2 x-4\sin x}\right)dx$
Q.14	A cylinder of greatest volume is inscribed in a cone, show that Volume of the cylinder $=\frac{4}{27}\pi h^3 \tan^2\alpha$. Where r, h, α are the radius, height and semi – vertical angle of the cone and R, H are the radius and height of the inscribed cylinder.
Q.15	Find the particular solution, satisfying the given condition, for the differential equation $\frac{dy}{dx}-\frac{y}{x}+\operatorname{cosec}\left(\frac{y}{x}\right)=0,\ y=0\ when\ x=1$. **OR** Solve the differential equation $\left[\frac{e^{-2\sqrt{y}}}{\sqrt{y}}-\frac{x}{\sqrt{y}}\right]\frac{dy}{dx}=1$; $(y\neq 0)$ and $y(1)=2$.
Q.16	Determine the values of a & b for which the function

	$f(x)=\begin{cases}\frac{\sin(a+1)x+2\sin x}{x}, & for\ x<0\\ 2, & for\ x=0\\ \frac{\sqrt{1+bx}-1}{x}, & for\ x>0\end{cases}$ is continuous at x = 0
Q.17	Find the interval in which f(x) = sin 3x – cos 3x , $x\in(0,\pi)$, is strictly increasing or strictly decreasing . **OR** Find the point on the curve $9y^2=x^3$, where the normal to the curve makes equal intercepts on the axes.
Q.18	If $y=x\log\left(\frac{x}{a+bx}\right)$ then, prove that $x^3\frac{d^2y}{dx^2}=\left(x\frac{dy}{dx}-y\right)^2$. OR If $x=a\sin 2t(1+\cos 2t)$ and y = b cos 2t (1 – cos 2t), then find $\frac{dy}{dx}$ at $t=\frac{\pi}{4}$.
Q.19	The probability of India wining a test match against West Indies is 1/3. Assuming independence from match to match .Find the probability that in a 5 match series India's second win occurs at the third test .
Q.20	Vectors $\vec{a}, \vec{b}, \vec{c}$ are of the same magnitude and taken pairwise in order form equal angles. If $\vec{a}=\hat{i}+\hat{j}$ and $\vec{b}=\hat{j}+\hat{k}$ find $\vec{c}$.
Q.21	Prove that : $\begin{vmatrix}-2a & a+b & a+c\\ b+a & -2b & b+c\\ c+a & c+b & -2c\end{vmatrix}=4(b+c)(c+a)(a+b)$.
Q.22	Find the value of k for which the following lines are perpendicular to each other $\frac{x+3}{k-5}=\frac{y-1}{1}=\frac{5-z}{-2k-1};\frac{x+2}{-1}=\frac{2-y}{-k}=\frac{z}{5}$.Hence find the

	equation of the plane containing the above lines.
Q.23	A bag contains (2n+1) coins. It is known that 'n' of these coins have a head on both its sides whereas the rest of the coins are fair. A coin is picked up at random from the bag and is tossed. If the probability that the toss results in a head is $\frac{31}{42}$, find the value of 'n,.
	PART – D **(Question 24 to 29 carry 6 mark each.)**
Q.24	Let A = W × W and let *be a binary operation on A defined by (a, b) * (c,d) = (ad + bc, bd) for all (a, b), (c,d) (a, b), (c,d) ∈ W × W. (1) Show that * is commutative on A. (2) Show that * is associative on A. (3) Find the identity element of * in A.
Q.25	Show that the equation of a plane, which meets the axes in A, B and C and the given controid of the triangle ABC is the point (α,β,γ), is $\frac{x}{\alpha}+\frac{y}{\beta}+\frac{z}{\gamma}=3$. If 3p is distance of plane from origin, show that $\alpha^{-2}+\beta^{-2}+\gamma^{-2}=p^{-2}$. **OR** Find the image of the line $\frac{x-1}{0}=\frac{y-3}{1}=\frac{z-4}{7}$ in the plane $2x-y+z+3=0$.
Q.26	Using integration, find the area of the region $\{(x,y): x^2+y^2\le 1\le x+\frac{y}{2};\ x,y\in R\}$
Q.27	If A = $\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$, prove that $(aI + bA)^n = a^n . I + na^{n-1} bA$ where I is a unit matrix of order 2 and n is a positive integer. **OR**

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	If $A=\begin{bmatrix}2 & -1 & 1\\ -1 & 2 & -1\\ 1 & -1 & 2\end{bmatrix}$, verify that $A^3-6A^2+9A-4I=0$. Using the result find A^{-1}.
Q.28	An aeroplane can carry a maximum of 200 passengers. A profit of Rs 1000 is made on each executive class ticket and a profit of Rs 600 is made on each economy class ticket. The airline reserves at least 20 seats for executive class. However, at least 4 times as many passengers prefer to travel by economy class than by the executive class. Determine how many tickets of each type must be sold in order to maximize the profit for the airline. What is the maximum profit?
Q.29	Evaluate : $\int_0^{\pi/4}\frac{\sec x}{1+2\sin^2 x}dx$. **OR** Evaluate $\int_0^a \sin^{-1}\sqrt{\frac{x}{a+x}}dx$.
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	" THE TWO MOST POWERFUL WARRIORS ARE PATIENCE AND TIME "