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

CODE:- AG-TS-5-2416 **REGNO:-TMC -D/79/89/36/63**

General Instructions :-

1. All question are compulsory.
2. The question paper consists of 26 questions divided into three sections A,B and C. Section – A comprises of 6 question of 1 mark each. Section – B comprises of 13 questions of 4 marks each and Section – C comprises of 7 questions of 6 marks each .
3. There is no overall choice. However, internal choice has been provided in 4 question of four marks and 2 questions of six marks each. You have to attempt only one If the alternatives in all such questions.
4. Use of calculator is not permitted.
5. Please check that this question paper contains 8 printed pages.
6. 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.

PRE-BOARD EXAMINATION 2015 -16

Time : 3 Hours — Maximum Marks : 100

CLASS – XII **CBSE** **MATHEMATICS**

PART – A

Q.1	Find values of x & y for which the vectors $\vec{a} = (x+2)\vec{i} - (x-y)\vec{j} + \vec{k}$ & $\vec{b} = (x-1)\vec{i} + (2x+y)\vec{j} + 2\vec{k}$ are parallel.
Q.2	Evaluate : $\sin\left(2\cos^{-1}\left(-\frac{3}{5}\right)\right)$.
Q.3	Evaluate : $\int_0^{\pi/2} \frac{2^{\sin x}}{2^{\sin x} + 2^{\cos x}}dx$.
Q.4	Find the differential equation of all non –horizontal lines in a plane .

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Q.5	Write the Cartesian equation of the plane bisecting the line segment joining the points A (2, 3, 5) and B (4, 5, 7) at right angles.
Q.6	Radius of a circle is increasing at rate of 3 cm/sec. Find the rate at which the area of circle is increasing at the instant when radius is 10 cm.

PART – B

Q.7	Prove that : $\tan^{-1}\left(\frac{\sqrt{1+\cos x}+\sqrt{1-\cos x}}{\sqrt{1+\cos x}-\sqrt{1-\cos x}}\right) = \frac{\pi}{4} - \frac{x}{2}$, where $\pi < x < \frac{3\pi}{2}$.
Q.8	Find the equation of the line drawn through point (1, 0, 2) to meet at right angles the line $\frac{x+1}{3} = \frac{y-2}{-2} = \frac{z+1}{-1}$.
Q.9	On the set {0, 1, 2, 3, 4, 5, 6}, a binary operation * is defined as : $a * b = \begin{cases} a+b, \text{ if } a+b<7 \\ a+b-7, \text{ if } a+b \geq 7 \end{cases}$. Write the operation table of the operation * and prove that zero is the identity for this operation and each element $a \neq 0$ of the set is invertible with $7-a$ being the inverse of 'a'. **OR** Let $f : w \to w$ be defined as $f(n) = \begin{cases} n-1, \text{ if } n \text{ is odd} \\ n+1, \text{ if } n \text{ is even} \end{cases}$. Then show that f is invertible. Also, find the inverse of f.
Q.10	A trust has ₹ 35,000 is to be invested in two different types of bonds. the first bond pays 8% interest per annum which will be given to orphanage and second bond pats 10% interest per annum which will be given to an N.G.O.(Cancer Aid Society.) using matrix multiplication,determine how to divide ₹ 35,000 among two types of bonds if the trust fund obtains an annual total interest of ₹ 3,200 what are the values refiected in this question?
Q.11	Find a unit vector perpendicular to the plane of triangle ABC, where the coordinates of its vertices are A(3, -1, 2), B(1, -1, -3) and C(4, -3, 1).
Q.12	If $y = \sqrt{x+1} - \sqrt{x-1}$, prove that $(x^2-1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - \frac{1}{4}y = 0$. **OR** Let $y = (\log x)^x + x^{x\cos x}$. Then find $\frac{dy}{dx}$.

Q.13 Find the point on the curve $\frac{x^2}{4}+\frac{y^2}{25}=1$ at which the tangent are (i) parallel to the x axis (ii) parallel to the y- axis .

Q.14 Evaluate the following indefinite integral : $\int \frac{1}{\sin x - \sin 2x} dx$.

Q.15 Evaluate $\int_{-1}^{2} (e^{3x} + 7x - 5) dx$ as a limit of sums.

Q.16 Using properties of determinants, prove that :

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = (1+a^2+b^2+c^2).$$

Q.17 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 .

OR

A problem in mathematics is given to 4 students A, B, C, D. their chances of solving the problem, respectively, are 1/3, 1/4, 1/5 and 2/3.What is the probability that (i) the problem will be solved? (ii) at most one of them will solve the problem?

Q.18 Examine the continuity of the function f defined by f(x) = $\begin{cases} x \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ at x = 0.

Q.19 Evaluate : $\int_0^{\pi/4} \frac{\sin x \cos x}{1 + \sin 4x} dx$.

PART – C

Q.20 If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$, verify that $A^3 - 6A^2 + 9A - 4I = 0$.

Q.21 Using integration, find the area bounded by the tangent to the curve $4y = x^2$ at the point (2, 1) and the lines whose equations are x = 2y and x = 3y - 3.

Q.22 Show that the semi vertical angle of right circular cone of given surface area and

mximum volume is $\sin^{-1}\frac{1}{3}$.

OR

A helicopter is flying along the curve $y = x^2 + 2$. A soldier is placed at the point (3, 2). Find the nearest distance between the soldier and the helicopter.

Q.23 A manufacturer makes two types of cups, A and B. Thee machines are required to manufacture the cups and the time in minutes required by each is as given below :

Type of Cup	Machines I	II	III
A	12	18	6
B	6	0	9

Each machine is available for a maximum period of 6 hours per day. If the profit on each cup A is 75 paise, and on B it is 50 paise, show that 15 cups of type A and 30 cups of type B should be manufactured per day to get the maximum profit.

Q.24 Find the direction ratios of the normal to the plane, which passes through the points (1, 0, 0) and (0, 1, 0) and makes angle $\frac{\pi}{4}$ which the plane x + y = 3. Also find the equation of the plane.

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.25 Solve the differential equation: (i) $\frac{d^2x}{dy^2} = y\sin^2 y$ (ii) $\sqrt{x}\frac{dy}{dx} + y = e^{-2\sqrt{x}}$.

Q.26 A Bag I contains 5 red and 4 white balls and a Bag II contains 3 red and 3 white balls. Two balls are transferred from the bag I to the Bag II and then one ball is drawn from the Bag II. If the ball drawn from the Bag II is red, then find the probability that one red ball and one white ball are transferred from the Bag I to the Bag II.

A BELIEVE THINGS CAN NOT MAKE THEMSELVES IMPOSSIBLE