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

25 Year of Quality Education

CODE:2201- TS-3

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 lf 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.

सामान्य निर्देश :

1. सभी प्रश्न अनिवार्य हैं।

2. इस प्रश्न पत्र में 29 प्रश्न है, जो 4 खण्डों में अ, ब,स व द है। खण्ड – अ में 4 प्रश्न हैं और प्रत्येक प्रश्न 1 अंक का है। खण्ड – ब में 8 प्रश्न हैं और प्रत्येक प्रश्न 2 अंको के हैं। खण्ड – स में 11 प्रश्न हैं और प्रत्येक प्रश्न 4 अंको का है। खण्ड – द में 6 प्रश्न हैं और प्रत्येक प्रश्न 6 अंको का है।

3. इसमें कोई भी सर्वोपरि विकल्प नहीं है, लेकिन आंतरिक विकल्प 3 प्रश्न 4 अंको में और 3 प्रश्न 6 अंको में दिए गए हैं। आप दिए गए विकल्पों में से एक विकल्प का चयन करें।

4. कैलकुलेटर का प्रयोग वर्जित हैं ।

5. कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ 6 हैं।
6. प्रश्न–पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर–पुस्तिका के मुख–पृष्ठ पर लिखें।

PRE-BOARD EXAMINATION 2016 -17

Time : 3 Hours   Maximum Marks : 100

CLASS – XII   **MATHEMATICS**

PART – A   (Question 1 to 4 carry 1 mark each.)

Q.1 If $\vec{a}$ and $\vec{b}$ are two unit vectors inclined to x-axis at angles $30°$ and $120°$ respectively, then write the value of $|\vec{a}+\vec{b}|$

Q.2 For what value of k, the matrix $\begin{pmatrix} 2k+3 & 4 & 5 \\ -4 & 0 & -6 \\ -5 & 6 & -2k-3 \end{pmatrix}$ is skew symmetric ?

Q.3 Find the sum of the degree and the order of differential equation : $\dfrac{d}{dx}\left[\left(\dfrac{d^2 y}{dx^2}\right)^4\right]=0$.

Q.4 Use elementary coloumn operation $C_2 \to C_2 + 2C_1$ in the following matrix equation : $\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$.

PART – B   (Question 5 to 12 carry 2 mark each.)

Q.5 Find the sine of the angle between the line $\dfrac{x-2}{3}=\dfrac{y-3}{4}=\dfrac{z-4}{5}$ and the plane $2x-2y+z-5=0$

Q.6 If $|\vec{a}|=a$, then find the value of $|\vec{a}\times\hat{i}|^2+|\vec{a}\times\hat{j}|^2+|\vec{a}\times\hat{k}|^2$

Q.7 Write the integrating factor of the following differential equation : $(1+y^2)+(2xy-\cot y)\dfrac{dy}{dx}=0$.

Q.8 Find the value of x for which the angle between the vectors

	$\vec{a} = 2x^2 i + 4xj + k \ \& \ \vec{b} = 7i - 2j + xk$ is obtuse.
Q.9	Find the differential equation for all the straight lines, which are at a unit distance from the origin.
Q.10	$$f(x) = \begin{cases} \dfrac{e^{1/x} - 1}{e^{1/x} + 1} & ,\text{if } x \neq 0 \\ -1 & ,\text{if } x = 0 \end{cases}$$ Show that the function f given by: is discontinuous at x=0.
Q.11	Show that the curves $2x = y^2 \ \& \ 2xy = k$ cut at right angles, if $k^2 = 8$.
Q.12	In a parliament election, a political party hired a public relations firm to promote its candidates in three ways - telephone, house calls and letters. The cost per contact (in paise) is given in matrix A as $$A = \begin{bmatrix} 140 \\ 200 \\ 150 \end{bmatrix} \begin{matrix} \text{Telephone} \\ \text{House cell} \\ \text{Letters} \end{matrix}$$ The number of contact of each type made in two cities X and Y is given in the matrix B as $$\begin{matrix} \text{Telephone} & \text{House call} & \text{Letters} \end{matrix}$$ $$B = \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} \begin{matrix} \text{City X} \\ \text{City Y} \end{matrix}$$ Find the total amount spent by the party in the two cities. What should one consider before casting his/her vote - party's promotional activity or their social activities ?
	PART – C (Question 13 to 23 carry 4 mark each.)

Q.13	Two trusts A & B receive Rs. 70000 and 55000 respectively from central government to award prize to persons of a district in 3 fields agriculture, education and social services. Trust a awarded 10, 5 and 15 persons in the field of agriculture, education and social services respectively while trust B awarded 15, 10 and 5 persons in the field of agriculture, education and social services respectively. If all three prizes together amount to Rs. 6000, them find amount of each prize by matrix method. What field you prefer most for award for development of society? Give answer with justifications.
Q.14	Evaluate $\int \left(\dfrac{1}{\sqrt{\sin^3 x \sin(x+a)}} \right) dx$. **OR** Evaluate : $\int (2\sin 2x - \cos x)\left(\sqrt{6 - \cos^2 x - 4\sin x} \right) dx$
Q.15	Verify mean value theorem for the function $f(x) = (x-4)(x-6)(x-8)$ on the interval [4, 10]. **OR** Find the point on the curve $9y^2 = x^3$, where the normal to the curve makes equal intercepts on the axes.
Q.16	Using the properties of determinants, prove the following : $$\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(1-x) & x(x-1)(x-2) & x(x+1)(x-1) \end{vmatrix} = 6x^2(1-x^2)$$
Q.17	Evaluate $\int_{-1}^{\frac{3}{2}} |x \sin \pi x| \, dx$
Q.18	Find the particular solution of the differential equation $(y - \sin x)dx + (\tan x)dy = 0$ satisfying the condition that $y = 0$ when $x = 0$.
Q.19	If $y = x^3 \log\left(\dfrac{1}{x}\right)$, then prove that $x \dfrac{d^2 y}{dx^2} - 2\dfrac{dy}{dx} + 3x^2 = 0$.
Q.20	In a set of 10 coins, 2 coins are with heads on both the sides. A coin is selected at random from this set and tossed five times. If all the five times, the result was heads, find the probability that the selected coin had heads on both the sides.

Q.21	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. **OR** Find the equation of the line passing through the point (-4, 3, 1), parallel to the plane $x + 2y - z = 0$ and intersecting the line $\frac{x+1}{3} = \frac{y-3}{-2} = \frac{z-2}{1}$.
Q.22	Evaluate $\int_0^4 (|x-1|+|x-2|+|x-3|)dx$.
Q.23	Prove that: $2\tan^{-1}\left\{\tan\frac{\alpha}{2}.\tan\left(\frac{\pi}{4}-\frac{\beta}{2}\right)\right\} = \tan^{-1}\frac{\sin\alpha\cos\beta}{\cos\alpha+\sin\beta}$ **OR** If $(\tan^{-1}x)^2 + (\cot^{-1}x)^2 = \frac{5\pi^2}{8}$ Find x .
	PART – D (Question 24 to 29 carry 6 mark each.)
Q.24	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.25	If $f : R - \left\{\frac{7}{5}\right\} \to R - \left\{\frac{3}{5}\right\}$ be defined as $f(x) = \frac{3x+4}{5x-7}$ & $g : R - \left\{\frac{3}{5}\right\} \to R - \left\{\frac{7}{5}\right\}$ be defined as $g(x) = \frac{7x+4}{5x-3}$. Prove that $gof = I_A$ & $(fog) = I_B$ where $B = R - \left\{\frac{3}{5}\right\}$ & $A = R - \left\{\frac{7}{5}\right\}$ .Find also g^{-1}, f^{-1} & $(gof)^{-1}$.
Q.26	A company manufactures three kinds of calculates : A, B and C is its two factories I and II. The company has got an order for manufacturing at least 6400 calculators of kind A, 4000 of kind B and 4800 of kind C. the daily output of factory I is of 50 calculators of kind A, 50 calculators of kind B, and 30 calculators of kind C. The daily output of factory II is of 40 calculators of kind A, 20 of kind B and 40 of kind C. The cost per day to run factory I is Rs. 12000 and of factory II is Rs. 15000. How many days do the two factories have to be in operation to produce the order with the minimum cost ? Formulate this problem as an LPP and solve it graphically.
Q.27	Two numbers are selected at random (without replacement) from positive integers 2,

	3, 4, 5, 6 and 7. Let X denote the larger of the two numbers obtained. Find the mean and variance of the probability distribution of X. **OR** Three cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of spades. Hence find the mean of the distribution.
Q.28	Prove that the lines line $\frac{x-3}{3} = \frac{2-y}{4} = \frac{z+1}{1}$ and x +2y + 3 z = 0 = 2x + 4 y + 3 z + 3 meet at a point (9,- 6,1) .
Q.29	In a school the school management committee wants to built a hall in the school . During the meeting it was decided that there should be 8 windows of same size in the hall for proper light and fresh air. Each window be in the form of rectangle surmounted by equilateral triangle . The total perimeter of each window is 15 meter . Find the dimensions of the rectangular part of each window so as to admit maximum light and fresh air through the whole opening. Write the two value points behind the decision. **OR** A given rectangular area is to be fenced off in a field whose length lies along a straight river. If no fencing is needed along the river, show that the least length of fencing will be required when length of the field is twice its breadth.
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	" STAY POSITIVE , WORK HARD AND MAKE IT HAPPEN "

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