TARGET MATHEMATICS

THE EXCELLENCE KEY

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25 Year of Quality Education

CODE:1501- TS-2

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	Find the derivative of f(log x) with respect to x, where f(x) = log x.
Q.2	If the value of third order determinant is 12, then find the value of the determinant formed by its cofactors.
Q.3	What is the distance of the point (p, q, r) from the x-axis?
Q.4	Find the sum of the order and the degree of the following differential equations $\frac{d^2y}{dx^2}+\sqrt[3]{\frac{dy}{dx}}+(1+x)=0$.
	PART – B (Question 5 to 12 carry 2 mark each.)
Q.5	How many equivalence relations on the set {1,2,3} containing (1,2) and (2,1) are there in all ? Justify your answer .
Q.6	For what values of k the function f(x) = x^2-kx+5 is increasing on (2, 4).
Q.7	Given f(x) = sin x check if function f is one-one for (i) (0,π) (ii) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$.
Q.8	Find the linear constraints for which the shaded fig . 1 area in the figure below is the solution set.

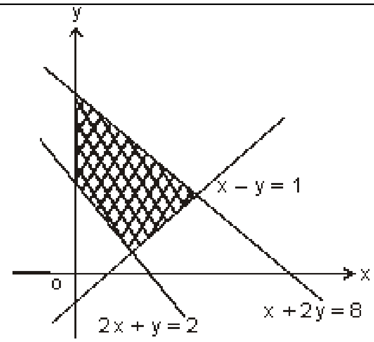

fig. 1

Q.9 Let li,mi,ni ; i = 1, 2, 3 be the direction cosines of three mutually perpendicular vectors in space. Show that $AA^T = I_3$, where A = $\begin{bmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{bmatrix}$.

Q.10 Solve for $x : \sin^{-1} 6x + \sin^{-1} 6\sqrt{3}x = -\frac{\pi}{2}$.

Q.11 Evaluate $\int \sqrt{1+\sin\frac{x}{4}}\,dx.$

Q.12 A four digit number is formed using the digits 1,2,3,5 with no repetitions. Find the probability that the numbers is divisible by 5.

PART – C **(Question 13 to 23 carry 4 mark each.)**

Q.13 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

If $p \neq 0, q \neq 0$ and $\begin{vmatrix} p & q & p\alpha+q \\ q & r & q\alpha+r \\ p\alpha+q & q\alpha+r & 0 \end{vmatrix} = 0$, then, using properties of determinants, prove that at least one of the following statements is true (a) p,q,r, are in G.P.,(b) α is a root of the equation $px^2 + 2qx + r = 0$.

Q.14 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 $y = x^3 - 11x + 5$ at which the tangent is y = x –11 .

Q.15 Define skew lines. Using only vector approach, find the shortest distance between the following two skew lines:

$\vec{r} = (8 + 3\lambda)\hat{i} - (9 + 16\lambda)\hat{j} + (10 + 7\lambda)\hat{k}$

$\vec{r} = 15\hat{i} + 29\hat{j} + 5\hat{k} + \mu(3\hat{i} + 8\hat{j} - 5\hat{k})$.

Q.16 A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lower most. Its semi – vertical angle is $\tan^{-1}(1/2)$. Water is poured into it at a constant rate of 5 cubic meter per minute. Find the rate at which the level of the water is rising at the instant when the depth of water in the tank is 10m.

Q.17 Minimize and maximize of Z = x + 2y subject to $x + 2y \geq 100; 2x - y \leq 0; 2x + y \leq 200; x, y \geq 0$.

Q.18 Evaluate : $\int_1^3 (5x^2 - e^x + 4)dx$ as a limit of sums

Q.19 Show that the differential equations $2y\, e^{x/y} dx + (y - 2x\, e^{x/y})dy = 0$ is homogeneous and find its particular solution given that x = 0 when y =1.

OR

The population of a village increases continuously at the rate proportional to the number of its inhabitants present at any time. If the population of the village was 20000 in 1999 and 25000 in the year 2004, what will be the population of the village in 2009?

Q.20 If the vectors $\vec{p} = a\hat{i} + \hat{j} + \hat{k}$, $\vec{q} = \hat{i} + b\hat{j} + \hat{k}$ and $\vec{r} = \hat{i} + \hat{j} + c\hat{K}$ are coplanar, then for a, b, c $\neq 1$ show that $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 1$.

Q.21 Find the area of the region bounded by the y-axis, y = cos x and y = sinx, $0 \le x \le \frac{\pi}{2}$

Q.22 A bag contains (2n +1) coins. It is known that 'n' of these coins ha e 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'.

Q.23 A die is thrown thrice. If getting a four is considered a success, find the probability distribution of number of successes. Also, find the mean and the variance of the distribution.

PART – D (Question 24 to 29 carry 6 mark each.)

Q.24 Three shopkeepers A, B, C are using polythene, handmade bags (prepared by prisoners), and newspaper's envelope as carry bags. It is found that the shopkeepers A, B, C are using (20, 30, 40), (30, 40, 20), (40, 20, 30) polythene, handmade bags and newspapers envelopes respectively. The shopkeepers A, B, C spent Rs. 250, Rs. 270& Rs. 200 on these carry bags respectively. Find the cost of each carry bags using matrices. Keeping in the mind the social & environmental conditions, which shopkeeper is better? Why?

Q.25 Find the summation of series: $\sum_{n=1}^{\infty}\left(\tan^{-1}\left(\frac{n}{n+2}\right) - \tan^{-1}\left(\frac{n-1}{n+1}\right)\right)$

OR

Let $f, g : R \to R$ be two functions defied as $f(x) = |x| + x$ & $g(x) = |x| - x$ $\forall x \in R$ then find fog and gof .

Q.26 Evaluate : $\int_0^{\pi} \frac{x\,dx}{1 - \cos\alpha \sin x}$ **.OR** Evaluate : $\int \frac{\sin x}{\sin^3 x + \cos^3 x}\,dx$.

Q.27 A magazine seller has 500 subscribers and collects annual subscription charges of Rs, 300 per subscriber. She proposes to increase the annual subscription charges and it is believed that for every increase of Re 1, one subscriber will discontinue. What increase will bring maximum income to her ? Make appropriate assumptions in order to apply derivatives to reach the solution. Write one important role of magazines in our lives.

OR

A printed page is to have a total area of 80 sq. cm. with margins of 1 cm at the top on each side and a margin of 1.5 cm at the bottom . What should be the dimensions of the page to maximize the printed area .

Q.28 Find the foot of the perpendicular from P(1, 2, 3) on the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$ .Also obtain the equation of the plane containing the line and the point (1, 2, 3).

Q.29 If x cos(a+y)= cos y then prove that $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$. Hence show that $\sin a \frac{d^2y}{dx^2} + \sin 2(a+y)\frac{dy}{dx} = 0$.

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" PUSH HARDER THAN YESTERDAY IF YOU WANT A DIFFERENT TOMORROW "