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

26 YEARS of quality education

CODE:2801- AG-TS-7

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.

PRE-BOARD EXAMINATION 2017 -18

Time : 3 Hours — Maximum Marks : 100

CLASS – XII — **MATHEMATICS**

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

Q.1	If the value of third order determinant is 12, than find the value of the determinant formed by its cofactors .

Q.2	Find the scalar m, such that the scalar product of $\hat{i}+\hat{j}+\hat{k}$ with the unit vector parallel to the sum of $2\hat{i}+4\hat{j}-5\hat{k}$ and $m\hat{i}+2\hat{j}+3\hat{k}$ is equal to unity.
Q.3	Given f(x) = sin x check if function f is one-one for (i) $(0,\pi)$ (ii) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$
Q.4	How many equivalence relations on the set {1,2,3} containing (1,2) and (2,1) are there in all ? Justify your answer .
	PART – B **(Question 5 to 12 carry 2 mark each.)**
Q.5	IF $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=\pi$, then prove that $x^2+y^2+z^2+2xyz=1$.
Q.6	A pair of fair dice is thrown. Find the probability that the sum is 10 or greater, if 5 appears on the first die.
Q.7	Find the differential equation of all the lines in the xy-plane.
Q.8	If $A=\begin{bmatrix}4 & 3\\ 2 & 5\end{bmatrix}$, find x and y such that $A^2-xA+yI=0$.
Q.9	Evaluate : $\int\left(\frac{1}{\sqrt{\sin^3 x\sin(x+a)}}\right)dx$.
Q.10	A man is walking at the rate of 6.5 km/hr towards the foot of a tower 120 m high. At what rate is he approaching the top of the tower when he is 50 m away from the tower ?
Q.11	Solve : $\cos^{-1}\left[\sin\left(\cos^{-1}x\right)\right]=\frac{\pi}{3}$.
Q.12	If a unit vector $\vec{a}$ makes angles $\frac{\pi}{4}$ and $\frac{\pi}{3}$ with x –axis and y – axis respectively and an acute angle θ with z-axis, then find θ and the (scalar

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	and vector) components of $\bar{a}$ along the axes.
	PART – C **(Question 13 to 23 carry 4 mark each.)**
Q.13	Evaluate : $\int \cos 2\theta \log\left(\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}\right)d\theta$.
Q.14	Show that the semi vertical angle of right circular cone of given surface area and maximum volume is $\sin^{-1}\frac{1}{3}$.
Q.15	From the differential equation of the family of curves given by $(a+bx)e^{y/x}=x$. OR Solve the differential equation, $(1+y+x^2y)dx+(x+x^3)dy=0$ where y = o when x = 1
Q.16	If x cos(a+y)= cos y then prove that $\frac{dy}{dx}=\frac{\cos^2(a+y)}{\sin a}$. Hence show that $\sin a\frac{d^2y}{dx^2}+\sin 2(a+y)\frac{dy}{dx}=0$.
Q.17	Verify mean value theorem for the function $f(x)=(x-4)(x-6)(x-8)$ on the interval [4, 10]. OR Find the value of p for when the curves $x^2=9p(9-y)$ and $x^2=p(y+1)$ cut each other at right angles.
Q.18	Let $f(x)=\begin{cases} x+a\sqrt{2}, & 0\le x\le \pi/4 \\ 2x\cot x+b, & \pi/4<x\le \pi/2 \\ a\cos 2x-b\sin x, & \pi/2<x\le \pi \end{cases}$ is continuous function on $0\le x\le\pi$. Then determine the values of 'a' and 'b' . What are your views

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	about ''learning ' ? Is 'learning' a continuous process? OR If $y=\sqrt{x+1}-\sqrt{x-1}$, prove that $(x^2-1)\frac{d^2y}{dx^2}+x\frac{dy}{dx}-\frac{1}{4}y=0$.
Q.19	Three numbers are selected at random (without replacement) from first six positive integers. If X denotes the smallest of the three numbers obtained, find the probability distribution of X. Also find the mean and variance of the distribution.
Q.20	Show that $\frac{1}{2}\vec{AC}\times\vec{BD}$ represents the vector area of the plane quadrilateral ABCD. Also find the area of quadrilateral whose diagonals are $4i-j-3k$ & $-2i+j-2k$.
Q.21	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.22	Vectors $\vec{AB}=3\hat{i}-\hat{j}+\hat{k}$ and $\vec{CD}=-3\hat{i}+2\hat{j}+4\hat{k}$ are non – coplanar. The position vectors of the points A and C are $6\hat{i}+7\hat{j}+4\hat{k}$ and $-9\hat{j}+2\hat{k}$ respectively. Find the position vectors of a point P on the line AB and a point Q on the line CD such that $\vec{PQ}$ is perpendicular to both $\vec{AB}$ and $\vec{CD}$.
Q.23	Of the students in a school, it is known that 30% have 100% attendance and 70% students are irregular. Previous year results that 70% of all

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students who have 100% attendance attain A grade and 10% irregular students attain A grade in their annual examination. At the end of the year, one students is chosen at random from the school and he was found to have an A grade. What is the probability that the students has 100% attendance? Is regularity required only in school?

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

Q.24 Let * be a binary operation on $N \times N$. If (a,b) * (c,d) = (ad + bc , bd) ; (a,b) ,(c,d) $\in N \times N$ .Prove that (i) * is closed to binary operation on $N \times N$ (ii) * is commutative on $N \times N$ (iii) * is associative on $N \times N$ (iii) Find the identity element with respect to operation * on $N \times N$ if any

Q.25 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

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.26 Using integration, find the area of the triangle bounded by the lines x + 2y = 2, y – x = 1 and 2x + y = 7.

OR

Using the method of integration find the area of the region enclosed between the circles $x^2 + y^2 = 1$ and $\left(x - \frac{1}{2}\right)^2 + y^2 = 1$.

Q.27 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 $px^2 + 2qx + r = 0$.

OR

Determine the values of a & b for which the system of linear equations has 2x + a y + 6 z = 8 ; x + 2y + b z = 5 ; x + y + 3 z = 4 (i) Unique solutions (ii) Many solutions (iii) No solutions .

Q.28 An oil company has two depots A and B with capacities of 7000 L and 4000 L respectively. The company is to supply oil to three petrol pumps, D, E and F whose requirements are 4500L, 3000L and 3500L respectively. The distance (in km) between the depots and the petrol pumps is given in the following table:

Distance in (km)		
From/To	**A**	**B**
D	7	3
E	6	4
F	3	2

Assuming that the transportation cost of 10 litres of oil is Re 1 per km, how should the delivery be scheduled in order that the transportation cost is minimum? What is the minimum cost?

Q.29 Evaluate : $\int_0^1 \cot^{-1}(1 - x + x^2)\,dx$.

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" THE TWO MOST POWERFUL WARRIORS ARE PATIENCE AND TIME "

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