TARGET MATHEMATICS by Dr. AGYAT GUPTA

The Excellence Key...

(M.Sc, B.Ed., M.Phill, P.hd)

CODE:1901- AG-TS-03 REG.NO:-TMC -D/79/89/36/63

General Instructions :-

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

(ii) This question paper contains **36** questions.

(iii) Question **1-20** in **PART- A are** Objective type question carrying **1** mark each.

(iv) Question **21-26** in **PART -B** are sort-answer type question carrying **2** mark each.

(v) Question **27-32** in **PART -C** are long-answer-**I** type question carrying **4** mark each.

(vi) Question **33-36** in **PART -D** are long-answer-**II** type question carrying **6** mark each

(vii) 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 8 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.

Time : 3 Hours — Maximum Marks : 80

CLASS – XII — **MATHEMATICS**

PRE-BOARD EXAMINATION 2019 -20

PART – A **(Question 1 to 20 carry 1 mark each.)**

SECTION I: Single correct answer type

This section contains 12 multiple choice question. Each question has four choices (A) , (B) , (C) &(D) out of which ONLY ONE is correct .

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Q.1 If a, b & c are non-zero real numbers, then

$$D = \begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix} =$$

(A) abc (B) $a^2b^2c^2$ (C) bc + ca + ab (D) zero

Q.2 In a skew symmetric matrix, the diagonal elements are all

(a) Different from each other (b) Zero

(c) One (d) None of these

Q.3 If θ be the angle between the unit vectors **a** and **b**, then $\cos\frac{\theta}{2} =$

(a) $\frac{1}{2}|\mathbf{a}-\mathbf{b}|$ (b) $\frac{1}{2}|\mathbf{a}+\mathbf{b}|$ (c) $\frac{|\mathbf{a}-\mathbf{b}|}{|\mathbf{a}+\mathbf{b}|}$ (d) $\frac{|\mathbf{a}+\mathbf{b}|}{|\mathbf{a}-\mathbf{b}|}$

Q.4 A man and his wife appear for an interview for two posts. The probability of the husband's selection is $\frac{1}{7}$ and that of the wife's selection is $\frac{1}{5}$. What is the probability that only one of them will be selected

(a) $\frac{1}{7}$ (b) $\frac{2}{7}$ (c) $\frac{3}{7}$ (d) None of these

Q.5 The shortest distance of the point (a, b, c) from the x-axis is

(a) $\sqrt{(a^2+b^2)}$ (b) $\sqrt{(b^2+c^2)}$ (c) $\sqrt{(c^2+a^2)}$ (d) $\sqrt{(a^2+b^2+c^2)}$

Q.6 If $2\tan^{-1}(\cos x) = \tan^{-1}(2\operatorname{cosec} x)$, then $x =$

(a) $\frac{3\pi}{4}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) None of these

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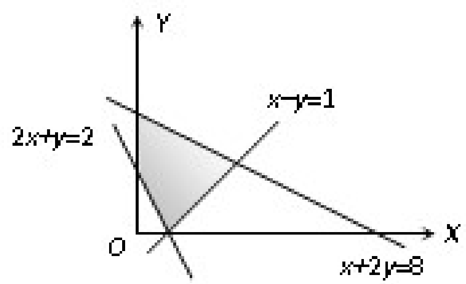
Q.7 There are n letters and n addressed envelopes. The probability that all the letters are not kept in the right envelope, is

(a) $\frac{1}{n!}$ (b) $1-\frac{1}{n!}$ (c) $1-\frac{1}{n}$ (d) None of these

Q.8 $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx =$

(a) $2\sqrt{\sec x}+c$ (b) $2\sqrt{\tan x}+c$ (c) $\frac{2}{\sqrt{\tan x}}+c$ (d) $\frac{2}{\sqrt{\sec x}}+c$

Q.9 For the following shaded area, the linear constraints except $x \geq 0$ and



$y \geq 0$, are

(a) $2x+y \leq 2, x-y \leq 1, x+2y \leq 8$ (b $2x+y \geq 2, x-y \leq 1, x+2y \leq 8$

(c) $2x+y \geq 2, x-y \geq 1, x+2y \leq 8$ (d) $2x+y \geq 2, x-y \geq 1, x+2y \geq 8$

Q.10 The angle between the lines $\frac{x+4}{1}=\frac{y-3}{2}=\frac{z+2}{3}$ and $\frac{x}{3}=\frac{y-1}{-2}=\frac{z}{1}$ is

(a) $\sin^{-1}\left(\frac{1}{7}\right)$ (b) $\cos^{-1}\left(\frac{2}{7}\right)$ (c) $\cos^{-1}\left(\frac{1}{7}\right)$ (d) None of these

Fill in the blanks (Q11 – Q15)

Q.11 A relation R is defined on the set Z of integer as follows : ${}^{x}R_{y} \Leftrightarrow x^2+y^2=25$. Then the number of order pair in R= ----

Q.12 The value of constant k=------ so that the given function is continuous at the indicate point; $f(x)=\begin{cases}\frac{(x+3)^2-36}{x-3}, & x \neq 3\\ k; & x=3\end{cases}$ at x = 3 .

Q.13 The following system of equation $3x-2y+z=0$, $\lambda x-14y+15z=0$, $x+2y-3z=0$ has a solution other than $x=y=z=0$ for $\lambda = ---$

Q.14 Oil is leaking at the rate of 16 mL/s from a vertically kept cylindrical drum containing oil. If the radius of the drum is 7 cm and its height is 60 cm, The rate at which the level of the oil is changing when the oil level is 18 cm is ----------------------

OR

The minimum value of the function $y=2x^3-21x^2+36x-20$ is -------

Q.15 If $\vec a$ and $\vec b$ are non-collinear vectors and $\vec A=(2x+3y-1)\vec a+(3x+2y+5)\vec b$ & $\vec B=(-x-4y)\vec a+(3x-4y+7)\vec b$, Then ($x$,y) = -------- such $7\vec A = 3\vec B$.

OR

If $\vec a = 3\hat i-\hat j-4\hat k$, $\vec b=-2\hat j+4\hat j-3\hat k$, $\vec c=\hat i+2\hat j-\hat k$. Then the unit vector parallel to $3\vec a-2\vec b+4\vec c = ----$

(Q16 - Q20) Answer the following questions

Q.16 Let A is a symmetric and B is a skew-symmetric matrix, such that $A-B=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}$. Then find |2A|.

Q.17 Evaluate: $\int_0^1 \cot^{-1}(1-x+x^2)dx.$

Q.18 Write the primitive of $\sqrt[3]{\sin^2 x \sec^{14} x}$

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Q.19 Evaluate: $\int \sqrt{\frac{\sin(x-\alpha)}{\sin(x+\alpha)}}dx$.

OR

Evaluate: $\int \frac{x^2 dx}{x^2+6x+12}$.

Q.20 If m and n are the order and degree, respectively of the differential equation $y = \left(\frac{dy}{dx}\right)^3 + x^3\left(\frac{d^2y}{dx^2}\right)^2 - xy = \sin x$, then write the value of m + n.

PART – B (Question 21 to 26 carry 2 mark each.)

Q.21 Solve for $x: \left(6\sin^{-1}x\right)^2 + \left(6\cos^{-1}x\right)^2 = 5\pi^2$.

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.22 If $xy = e^{(x-y)}$, then show that $\frac{dy}{dx} = \frac{y(x-1)}{x(y+1)}$.

Q.23 A kite is moving horizontally at a height of 151.5 meters. If the speed of kite is 10 m/s, how fast is the string being let out; when the kite is 250 m away from the boy who is flying the kite? Assume that the height of boy is 1.5 m.

Q.24 Find the value (s) of λ, such that the volume of a parallelepiped whose adjacent edges are represented by vectors $\lambda\hat{i} - 2\hat{j}, 3\hat{j} + \hat{k}, 4\hat{i} - 4\hat{k}$ is 40 cu units.

OR

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.25 Find the distance of (3, -5, 12) from its image in the x-axis.

Q.26 Four cards are drawn successively with replacement from a well shuffled deck of 52 playing cards. What is the probability that only 2 cards are spades?

PART – C (Question 27 to 32 carry 4 mark each.)

Q.27 Let N denote the set of all natural number and R be a relation on $N \times N$ defined by $(a,b)R(c,d) \Leftrightarrow ad(b+c) = bc(a+d)$. Cheque whether R is an equlivance relation

Q.28 If x cos(a+y)= cos y then prove that $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$. Hence show that $\sin a \frac{d^2y}{dx^2} + \sin 2(a+y)\frac{dy}{dx} = 0$.

OR

If $y = e^{ax}.\cos bx$, then prove that $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$.

Q.29 Solve the differential equation dy + (3y cot x- sin2x) dx = 0 given y = 2 when x = $\pi/2$.

Q.30 Prove that: $\int_0^{\pi/2} \log \sin x dx = \int_0^{\pi/2} \log \cos x dx = -\frac{\pi}{2}\log 2$.

OR

Evaluate: $\int \frac{1}{\sin x - \sin 2x}dx$

Q.31 In an examination, 10 questions of true- false type are asked. A student tosses a fair coin and determine his answer to each question. If the coin falls heads, he answers true and if it falls tails, he answers false. Show that the probability that he answers at most 7 questions correctly is $\frac{121}{128}$.

OR

Suppose a girl throws a die . If she gets a 1 or 2 , she tosses a coin three times and note the number of heads . If she gets a 3 , 4, 5 or 6 , she tosses a coin once and notes whether a heads or tail is obtained . If she obtained exactly one head ;what is the probability that she threw 3 , 4 , 5 or 6 with the die .

Q.32 Postmaster of a post office wishes to hire extra helpers during the Diwali season, because of a large increase in the volume of mail handling and delivery. Due to the limited office space and the budgetary conditions, the number of temporary helpers must not exceed 10.According to past experience, a man can handle 300 letters and 80 packages per day, on the average, and a woman can handle 400 letters and 50 packets per day. The postmaster believes that the daily volume of extra mail and packages will be no less than 3400 and 680 respectively. A man receives Rs. 225 a day and a woman receives Rs. 200 a day. How many men and women helpers should be hired to keep the pay-roll at a minimum? Formulate an LPP and solve it graphically.

PART – D (Question 33 to 36 carry 6 mark each.)

Q.33 Using properties of determinants, prove that

$$\begin{vmatrix} \frac{(a+b)^2}{c} & c & c \\ a & \frac{(b+c)^2}{a} & a \\ b & b & \frac{(c+a)^2}{b} \end{vmatrix} = 2(a+b+c)^3 .$$

OR

A university gives scholarships for those students who take any of the below subjects as an additional subject in first year, second year, third year of graduation. From the table given below, form a set of simultaneous equations and check the consistency.

Sr. No	Subject	No. Of students in 1^{st} year	No. of students in 2^{nd} year	No. of students in 3^{rd} year
1.	Industrial Waste	1	3	6
2.	Organic Waste	1	1	7
3.	e- Waste	1	1	8
	Amount Received	Rs. 5000	Rs. 7000	Rs. 35800

Q.34 Find the area of the origin : $\{(x,y): 0 \le y \le x^2, 0 \le y \le x+2; 0 \le x \le 3\}$

Q.35 Show that the normal at any point θ to the curve x = $a\cos\theta + a\theta\sin\theta$ and $y = a\sin\theta - a\theta\cos\theta$ is at constant distance from the origin.

OR

The sum of the surface areas of a rectangular parallelepiped with side x, 2x and $\frac{x}{3}$ and a sphere gives to the constant. Prove that the sum of their volume is minimum if x is equal to three times the radius of sphere. Find the minimum value of the sum of the volumes.

Q.36 Find the vector equation of the plane through the line of intersection of the planes x + y + z = 1 and 2x + 3y + 4z = 5 which is perpendicular to the plane x – y + z = 0. Hence find whether the plane thus obtained contains the line $\frac{x+2}{5} = \frac{y-3}{4} = \frac{z}{5}$ or not

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