CODE:1602- AG-TS-07

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 .

Q.1 If two matrices A and B are of order $p \times q$ and $r \times s$ respectively, can be subtracted only, if

(a) $p = q$ (b) $p = q, r = s$

(c) $p = r, q = s$ (d)None of these

Q.2 If $A = dig(2,-1,3), B = dig(-1,3,2)$, then $A^2B =$

(a) $dig\ (5, 4, 11)$ (b)$dig\ (-4, 3, 18)$

(c) $dig\ (3, 1, 8)$ (d)B

Q.3 The area of a triangle whose vertices are $A(1,-1,2)$, $B(2,1,-1)$ and $C(3,-1,2)$ is

(a) 13 (b) $\sqrt{13}$ (c) 6 (d) $\sqrt{6}$

Q.4 A man is known to speak the truth 3 out of 4 times. He throws a die and reports that it is a six. The probability that it is actually a six, is

(a) $\frac{3}{8}$ (b) $\frac{1}{5}$ (c) $\frac{3}{4}$ (d) None of these

Q.5 If $\tan^{-1} x + 2\cot^{-1} x = \frac{2\pi}{3}$, then $x =$

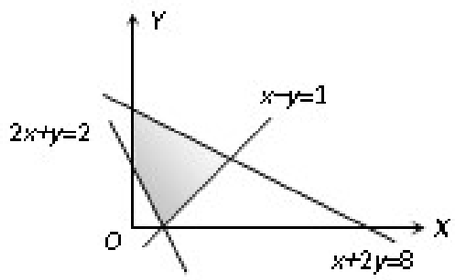
(a) $\sqrt{2}$ (b) 3 (c) $\sqrt{3}$ (d) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

Q.6 In a single throw of two dice what is the probability of obtaining a number greater than 7, if 4 appears on the first dice

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{12}$ (d) None of these

Q.7 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.8 $\int \frac{x^3}{\sqrt{1-x^8}}dx =$

(a) $\frac{1}{2}\sin^{-1}(x^4)+c$ (b) $\frac{1}{3}\sin^{-1}(x^4)+c$ (c) $\frac{1}{4}\sin^{-1}(x^4)+c$ (d)None of these

Q.9 The straight line $\frac{x-3}{3}=\frac{y-2}{1}=\frac{z-1}{0}$ is

(a)Parallel to x-axis (b) Parallel to y-axis

(c)Parallel to z-axis (d) Perpendicular to z-axis

Q.10 The straight lines $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z-3}{3}$ and $\frac{x-1}{2}=\frac{y-2}{2}=\frac{z-3}{-2}$ are

(a) Parallel lines (b) Intersecting at $60°$

(c)Skew lines (d) Intersecting at right angle

Fill in the blanks (Q11 – Q15)

Q.11 Total number of one-one functions from set A and set B, where A = {1, 2, 3, 4}, B={a, b, c }is ----------

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Q.12 If $A^2 = A$ for $A=\begin{bmatrix}-1 & b\\ -b & 2\end{bmatrix}$, then find the value of b=--------- .

Q.13 The value of (a , b)= …….. such that the function f defined by f(x) =

$$\begin{cases} 5 & if \quad x \leq 2 \\ ax+b & if \quad 2 < x < 10 \\ 21 & if \quad x \geq 10 \end{cases}$$,if f(x) is continuous on [0 , 10] . .

Q.14 A man of height 1.8 metre is moving away from a lamp post at the rate of 1.2 $m/\sec$. If the height of the lamp post be 4.5 metre, then the rate at which the shadow of the man is lengthening is

(a) $0.4\ m/\sec$ (b) $0.8\ m/\sec$ (c) $1.2\ m/\sec$ (d)None of these

OR

If $x + y = 10$, then the maximum value of xy is

(a) 5 (b) 20 (c) 25 (d) None of these

Q.15 If $\vec{a}$ and $\vec{b}$ are two non-collinear unit vectors such that $\left|\vec{a}+\vec{b}\right| = \sqrt{3},$ then $(2\vec{a}-5\vec{b}).(3\vec{a}+\vec{b}) = ----$

OR

For two non zero vector $\vec{a}$ and $\vec{b}$ write when $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}\right| + \left|\vec{b}\right|$ holds if --

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(Q16 - Q20) Answer the following questions

Q.16 Determine order and degree(if defined) of differential equation $\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$.

Q.17	Evaluate: $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (2\sin\|x\| + \cos\|x\|)dx$.
Q.18	Evaluate: $\int \frac{1}{\sqrt{x} + x} dx$
Q.19	Evaluate: $\int \frac{(x^4 - x)^{1/4}}{x^5} dx$ **OR** Evaluate: $\int \frac{(x^4 - x)^{1/4}}{x^5} dx$
Q.20	For the determinant $\begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$, find the value of $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13}$, A_{ij} is cofactor of element a_{ij}.
	PART – B (Question 21 to 26 carry 2 mark each.)
Q.21	Prove that : $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$. **OR** Let A = {-1, 0, 1, 2}, B = {-4, -2, 0, 2} and $f, g : A \to B$ be functions defined by $f(x) = x^2 - x, x \in A$ and $g(x) = 2\left\|x - \frac{1}{2}\right\| - 1, x \in A$ are f and g

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	equal. Justify your answer.
Q.22	If $y = \tan^{-1}\left(\frac{\sqrt{x} - x}{1 + x^{3/2}}\right)$ find $\frac{dy}{dx}$ at x = 1 .
Q.23	Using differentials, find the approximate value of $\sqrt{.082}$.
Q.24	Find the values of λ and μ, if the vectors $\lambda\hat{i} - 3\hat{j} - 6\hat{k}$ and $3\hat{i} - \mu\hat{j} - 2\hat{k}$ are mutually perpendicular vectors of equal magnitude. **OR** Find the angles at which the vector $\hat{i} + 2\hat{j} - 2\hat{k}$ is inclined to each of the coordinate axes.
Q.25	Find the equation of the line passing through the point (3, 0, 1) and parallel to the planes $x + 2y = 0$ and $3y - z = 0$.
Q.26	A bag contains 4 green and 6 white balls. Two balls are drawn one by one without replacement. If the second ball drawn is white, what is the probability that the first ball drawn is also white?
	PART – C (Question 27 to 32 carry 4 mark each.)
Q.27	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.28	Verify that $y = e^{m\cos^{-1}x}$ satisfies the differential equation $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - m^2y = 0$. **OR** If $y = \left(\sqrt{x}\right)^{\left(\sqrt{x}\right)^{\left(\sqrt{x}\right)^{\cdots\infty}}}$, show that $\frac{dy}{dx} = \frac{y^2}{x(2 - y\log x)}$.

Q.29	Check whether the following differential equation is homogeneous or not $x^2\frac{dy}{dx} - xy = 1 + \cos\left(\frac{x}{y}\right), x \neq 0$ .Find the general solution of the differential equation using substitution y=vx.
Q.30	Find $\int_0^2 (x^2 + e^{2x+1})\,dx$ as the limit of a sum. **OR** Evaluate: $\int \frac{e^{\tan^{-1}x}}{(1+x^2)^2}\,dx$.
Q.31	An urn contains 5 red and 2 black balls.Two balls are randomly drawn, without replacement. Let x represent the number of black balls drawn. What are the possible values of X? Is X a random variable ? If yes, find the mean and variance of X. **OR** The probability of a shooter hitting a target is 3 / 4 . How many minimum number of times must he/she fire so that the probability of hitting the target at least once is more than 0.99?
Q.32	A merchant plans to sell two types of personal computers – a desktop model and a portable model that will cost Rs 25000 and Rs 40000 respectively. He estimates that the total monthly demand of computers will not exceed 250 units. Determine the number of units of each type of computers which the merchant should stock to get maximum profit if he does not want to invest more than Rs 70 lakhs and if his profit on the desktop model is Rs 4500 and on portable model is Rs 5000.
	PART – D (Question 33 to 36 carry 6 mark each.)
Q.33	Using the properties of determinants:

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	$\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(1-x) & x(x-1)(x-2) & x(x+1)(x-1) \end{vmatrix} = 6x^2(1-x^2)$. **OR** Use matrix method to examine the given system of equations for consistency or inconsistency. If consistent, then solve it. x + y + z = 1, 2x + 2y + 2z = 2, 3x + 3y + 3z = 3.
Q.34	Find the area of the triangle formed by negative *x*-axis, and the normal and tangent to the circle $x^2 + y^2 = 9$ *at* $(-1, 2\sqrt{2})$ using integration
Q.35	Find the point on the curve $y = \frac{x}{1+x^2}$, where the tangent to the curve has the greatest slope. **OR** A point on the hypotenuse of a right triangle is at a distance 'a' and 'b' from the sides of the triangle. Show that the minimum length of the hypotenuse is $[a^{2/3} + b^{2/3}]^{3/2}$.
Q.36	Find the equation of plane through the point A (1,1,0) B (1 ,2 ,1) and C(-2 , 2 , - 1) and find the distance between the plane and the line $\frac{x-6}{3} = \frac{y-3}{-1} = \frac{z+2}{1}$.
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	महानता कभी न गिरने में नहीं बल्कि हर बार गिरकर उठ जाने में है

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