CODE:0501- AG-TS-1 **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 $A=\begin{bmatrix}4 & 6 & -1\\ 3 & 0 & 2\\ 1 & -2 & 5\end{bmatrix}, B=\begin{bmatrix}2 & 4\\ 0 & 1\\ -1 & 2\end{bmatrix}, C=\begin{bmatrix}3\\ 1\\ 2\end{bmatrix}$, then the expression which is not defined is
(a) $A^2+2B-2A$ (b) CC' (c) $B'C$ (d) AB

Q.2 If $\mathbf{r}.\mathbf{i}=\mathbf{r}.\mathbf{j}=\mathbf{r}.\mathbf{k}$ and $|\mathbf{r}|=3$, then $\mathbf{r}=$
(a) $\pm 3(\mathbf{i}+\mathbf{j}+\mathbf{k})$ (b) $\pm\frac{1}{3}(\mathbf{i}+\mathbf{j}+\mathbf{k})$
(c) $\pm\frac{1}{\sqrt{3}}(\mathbf{i}+\mathbf{j}+\mathbf{k})$ (d) $\pm\sqrt{3}(\mathbf{i}+\mathbf{j}+\mathbf{k})$

Q.3 From a pack of 52 cards two are drawn with replacement. The probability, that the first is a diamond and the second is a king, is
(a) $\frac{1}{26}$ (b) $\frac{17}{2704}$ (c) $\frac{1}{52}$ (d) None of these

Q.4 The distance of the point $(4, 3, 5)$ from the y-axis is
(a) $\sqrt{34}$ (b)5 (c) $\sqrt{41}$ (d) $\sqrt{15}$

Q.5 If $4\sin^{-1}x+\cos^{-1}x=\pi$, then x is equal to
(a) 0 (b) $\frac{1}{2}$ (c) $-\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{2}}$

Q.6	The probability of hitting a target by three marksmen are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. The probability that one and only one of them will hit the target when they fire simultaneously, is (a) $\frac{11}{24}$ (b) $\frac{1}{12}$ (c) $\frac{1}{8}$ (d) None of these
Q.7	$\int \frac{x\,dx}{1 - x\cot x} =$ (a) $\log(\cos x - x\sin x) + c$ (b) $\log(x\sin x - \cos x) + c$ (c) $\log(\sin x - x\cos x) + c$ (d) None of these
Q.8	The necessary condition for third quadrant region in xy-plane, is (a) $x > 0, y < 0$ (b) $x < 0, y < 0$ (c) $x < 0, y > 0$ (d) $x < 0, y = 0$
Q.9	The perpendicular distance of the point (2, 4, –1) from the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$ is (a) 3 (b) 5 (c) 7 (d) 9
	Fill in the blanks (Q11 – Q15)
Q.10	If $M = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $M^2 - \lambda M - I_2 = 0$, then $\lambda =$ ---------------
Q.11	The relation $R = \{(a,b) : a^2 - 4ab + 3b^2 = 0; a, b \in R\}$ is --------------
Q.12	If $y = \log_{10} x + \log_x 10 + \log_x x + \log_{10} 10$, then $\frac{dy}{dx} = -----$
Q.13	If $\begin{bmatrix} 1 & -1 & x \end{bmatrix} \begin{bmatrix} 0 & 1 & -1 \\ 2 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} = 0$, Then $x = --------$.
Q.14	The volume of a spherical balloon in increasing at the rate of 25 cubic centimeters per second. The rate of change of its surface at the instant when its radius is 5 cm is --------- OR The tangent to the curve $y = ax^2 + bx$ at $(2, -8)$ is parallel to x-axis. Then a = …….& b = ……..
Q.15	If $\vec{a}$ and $\vec{b}$ are two non-collinear unit vectors such that $\lvert \vec{a} + \vec{b} \rvert = \sqrt{3}$, 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 $\lvert \vec{a} + \vec{b} \rvert = \lvert \vec{a} \rvert + \lvert \vec{b} \rvert$ holds if --------- ------
	(Q16 - Q20) Answer the following questions
Q.16	If A and B are invertible matrices of order 3, |A| = 2 and | (AB)$^{-1}$| = $-\frac{1}{6}$, then |B| …………..
Q.17	Evaluate: $\int_0^{\pi/2} \frac{\cos^2 x dx}{1 + 3\sin^2 x}$.
Q.18	Evaluate: $\int \frac{dx}{\sqrt{\sin^3 x \sin(x + \alpha)}}$.
Q.19	Evaluate: $\int \frac{(\sin x - x\cos x) dx}{x(x + \sin x)}$. **OR** Evaluate: $\int \sqrt{\frac{\cos x - \cos^3 x}{1 - \cos^3 x}}\, dx$
Q.20	Find the sum of the degree and the order for the following differential

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Target Mathematics by- Dr.Agyat Gupta

visit us: agyatgupta.com ; Resi.: D-79 Vasant Vihar ; Office : 89-Laxmi bai colony
Ph. : 4010685(O), 7000636110(O) Mobile : 9425109601(P)

equation $\frac{d}{dx}[(\frac{d^2y}{dx^2})^4]=0$.

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

Q.21 Prove that: $\tan^{-1}\left(\frac{6x-8x^3}{1-12x^2}\right)-\tan^{-1}\left(\frac{4x}{1-4x^2}\right)=\tan^{-1}2x$.

OR

Consider $f:R-\left\{-\frac{4}{3}\right\}\to R-\left\{\frac{4}{3}\right\}$, given by $f(x)=\frac{4x+3}{3x+4}$. Show that f is bijective. Find the inverse of f and hence find $f^{-1}(0)$ and x such that $f^{-1}(x)=2$.

Q.22 If $y=\tan^{-1}\left(\frac{x}{a}\right)+\log\sqrt{\frac{x-a}{x+a}}$: prove that $\frac{dy}{dx}=\frac{2ax^2}{x^4-a^4}$.

Q.23 Find the intervals in which the function f defined by $f(x)=-2x^3-9x^2-12x+1$ is(i) strictly increasing(ii)strictly decreasing .

Q.24 If $\vec{a}=\mathbf{i}+\mathbf{j}+\mathbf{k},\vec{b}=\mathbf{i}+3\mathbf{j}+5\mathbf{k}$ and $\vec{c}=7\mathbf{i}+9\mathbf{j}+11\mathbf{k}$, then find the area of the parallelogram having diagonals $\vec{a}+\vec{b}$ and $\vec{b}+\vec{c}$.

OR

Let $\vec{a}=2\vec{i}+\vec{k},\vec{b}=\vec{i}+\vec{j}+\vec{k}$ and $\vec{c}=4\vec{i}-3\vec{j}+3\vec{k}$ be three vectors , find a vector $\vec{r}$ which satisfies $\vec{r}\times\vec{b}=\vec{c}\times\vec{b}$ and $\vec{r}\bullet\vec{a}=0$.

Q.25 Find the symmetrical form, the equation of the line $2x-2y+3z-2=0,x-y+z+1=0$.

Q.26 A bag contains 5 red balls and 3 black balls three balls are drawn one by one without replacement. What is the probability that at least one of the three balls be black if the first balls are red?

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

Q.27 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.28 Find the value of 'a' for which the function f defined as f(x) = $\begin{cases} a\sin\frac{\pi}{2}(x+1) , & x\le 0 \\ \frac{\tan x-\sin x}{x^3} , & x>0 \end{cases}$ is continuous at x = 0.

OR

If $y=x^x$, prove that $\frac{d^2y}{dx^2}-\frac{1}{y}\left(\frac{dy}{dx}\right)^2-\frac{y}{x}=0$.

Q.29 Find the particular solution of the differential equation $(xdy-ydx)y.\sin\left(\frac{y}{x}\right)=(ydx+xdy)x\cos\frac{y}{x}$, given that $y=\pi$ when x = 3 .

Q.30 Evaluate : $\int_{-1}^{2}(e^{3x}+7x-5)dx$ as a limit of sums.

OR

Evaluate : $\int\frac{\tan x+\tan^3 x}{1+\tan^3 x}dx$.

Q.31 In a hockey match, both team A and B scored same number of goals up

	to the end of the game, so to decide the winner, the referee asked both the captains to throw a die altemately and decided the the team, whose captain gets a six first, Will be declared the winner. If the captain of team A was asked to start, find their respective probabilities of winning the math. **OR** Consider the experiment of tossing a coin. If the coin shows head, toss it again but if it shows tail, then throw a die. Find the conditional probability of the event that 'the die shows a number greater than 4' given that 'there is at least one tail'.
Q.32	An aeroplane can carry a maximum of 200 passengers. A profit of Rs 1000 is made on each executive class ticket and a profit of Rs 600 is made on each economy class ticket. The airline reserves at least 20 seats for executive class. However, at least 4 times as many passengers prefer to travel by economy class than by the executive class. Determine how many tickets of each type must be sold in order to maximize the profit for the airline. What is the maximum profit?
	PART – D **(Question 33 to 36 carry 6 mark each.)**
Q.33	If $x \neq y \neq z$ and $\begin{vmatrix} x & x^3 & x^4-1 \\ y & y^3 & y^4-1 \\ z & z^3 & z^4-1 \end{vmatrix} = 0$ then prove that xyz(xy +yz +zx) = x+ y+ z. **OR** 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 the unit matrix of order 2 and n is a positive integer .
Q.34	Using integration, find the area of the triangle bounded by the lines x + 2y = 2, y – x = 1 and 2x + y = 7.
Q.35	A poster is to contain 72sq. cm. of printed matter . The margins at the top and bottom are to be 4 cm each and at the sides 2 cm each side wide. Find the dimensions if total area of the poster is minimum . **OR** Water is running into a conical vessel ,15 cm deep and 5 cm in radius , at the rate of 0.1 cm^3 / sec . When the water is 6cm deep, find at what rate is (i) the water level rising ? (ii) the water –surface area increasing ? (iii) the wetted surface of the vessel increasing ?
Q.36	Find the vector equation of the planes through the intersection of $\left(2\hat{i} + 6\hat{j}\right) + 12 = 0$ and $\bar{r}.\left(3\hat{i} - \hat{j} + 4\hat{k}\right) = 0$ which are at a unit distance from the origin. Hence find the distance of the plane thus obtained from the plane 2x – 4y + 4z – 9 = 0 .
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