CODE:1201- AG-TS-2

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 $\begin{bmatrix} x^2+x & x \\ 3 & 2 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ -x+1 & x \end{bmatrix} = \begin{bmatrix} 0 & -2 \\ 5 & 1 \end{bmatrix}$ then x is equal to -

(A) – 1 (B) 2 (C) 1 (D) No value of x

Q.2 If $\begin{vmatrix} x+1 & 3 & 5 \\ 2 & x+2 & 5 \\ 2 & 3 & x+4 \end{vmatrix} = 0$, then x = ……

Q.3 If **a**, **b**, **c** are mutually perpendicular vectors of equal magnitudes, then the angle between the vectors **a** and $\mathbf{a}+\mathbf{b}+\mathbf{c}$ is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\cos^{-1}\frac{1}{\sqrt{3}}$ (d) $\frac{\pi}{2}$

Q.4 The probability of *A*, *B*, *C* solving a problem are $\frac{1}{3},\frac{2}{7},\frac{3}{8}$ respectively. If all the three try to solve the problem simultaneously, the probability that exactly one of them will solve it, is

(a) $\frac{25}{168}$ (b) $\frac{25}{56}$ (c) $\frac{20}{168}$ (d) $\frac{30}{168}$

Q.5 The direction cosines of the normal to the plane $3x+4y+12z=52$ will be

	(a) $3, 4, 12$ (b) $-3, -4, -12$ (c) $\frac{3}{13}, \frac{4}{13}, \frac{12}{13}$ (d) $\frac{3}{\sqrt{13}}, \frac{4}{\sqrt{13}}, \frac{12}{\sqrt{13}}$
Q.6	If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$, then (a) $x + y + z - xyz = 0$ (b) $x + y + z + xyz = 0$ (c) $xy + yz + zx + 1 = 0$ (d) $xy + yz + zx - 1 = 0$
Q.7	Two card are drawn successively with replacement from a pack of 52 cards. The probability of drawing two aces is (a) $\frac{1}{169}$ (b) $\frac{1}{221}$ (c) $\frac{1}{2652}$ (d) $\frac{4}{663}$
Q.8	Evaluate: $\int x^{51}(\tan^{-1} x + \cot^{-1} x)\, dx =$ (a) $\frac{x^{52}}{52}(\tan^{-1} x + \cot^{-1} x) + c$ (b) $\frac{x^{52}}{52}(\tan^{-1} x - \cot^{-1} x) + c$ (c) $\frac{\pi x^{52}}{104} + \frac{\pi}{2} + c$ (d) $\frac{x^{52}}{52} + \frac{\pi}{2} + c$
Q.9	The solution of set of constraints $x + 2y \geq 11$, $3x + 4y \leq 30$, $2x + 5y \leq 30$, $x \geq 0$, $y \geq 0$ includes the point (a) (2, 3) (b) (3, 2) (c) (3, 4) (d) (4, 3)
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 – Q16)

Q.11	If $f : R \to R$ be given by $f(x) = (3 - x^3)^{1/3}$, then $fof\ (x)$ =----- .

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Q.12	If $y = x^{e^{-x^2}}$, then $\frac{dy}{dx}$ ……..
Q.13	If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, Then the value of x = ----------
Q.14	The side of a square sheet of metal is increasing at 3 centimeters per second. Rate of area increasing when the side is 10 cm long is ---------- OR The value of c in Rolle's theorem for the function $f(x) = x^3 - 3x$ in $[-\sqrt{3}, 0]$ …….
Q.15	The projection of the vector $\hat{i} - 2\hat{j} + \hat{k}$ on the vector $4\hat{i} - 4\hat{j} + 7\hat{k}$ is ------ **OR** If $\hat{a}, \hat{b}$ and $\hat{c}$ are mutually perpendicular unit vectors, then the value of $\lvert 2\hat{a} + \hat{b} + \hat{c} \rvert =$ ------.
Q.16	If $A = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ then for any natural number n, Then the value of $\lvert A^n \rvert$ = ……

(Q17 - Q20) Answer the following questions

Q.17	Evaluate: $\int_{-\pi/2}^{\pi/2} \sin\lvert x \rvert\, dx.$
Q.18	Evaluate: $\int 2^{2^{2^x}} 2^{2^x} 2^x\, dx.$
Q.19	Evaluate: $\int_{-1}^{2} \lvert x^3 - x \rvert\, dx$. **OR**

	Evaluate: $\int \frac{\sqrt{1+\cos x}}{(1-\cos x)^{5/2}}dx$.
Q.20	Find the product of the order and degree of the following differential equation: $x(\frac{d^2y}{dx^2})^2+(\frac{dy}{dx})^2+y^2=0$.
	PART – B (Question 21 to 26 carry 2 mark each.)
Q.21	Prove that: $\cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)=\frac{\pi}{2}-\frac{x}{2};x\in\left(\frac{\pi}{2},\pi\right)$ **OR** Check whether the relation R in R defined by $R=\{(a,b):a\le b^3\}$ is reflexive, symmetric or transitive.
Q.22	If $xy+xe^{-y}+ye^{x}=x^2$, Find $\frac{dy}{dx}$.
Q.23	Using differentials, find the approximate value of fourth root of $\frac{83}{256}$.
Q.24	If the vectors $\vec{a}=2\hat{i}-\hat{j}+\hat{k}$, $\vec{b}=\hat{i}+2\hat{j}+3\hat{k}$ and $\vec{c}=3\hat{i}+\lambda\hat{j}+5\hat{k}$ are coplanar, find the value of λ. **OR** Find a unit vector perpendicular to the plane of triangle ABC, where the coordinates of its vertices are A(3, -1, 2), B(1, -1, -3) and C(4, -3, 1).
Q.25	Show that the line $\vec{r}=(\hat{i}+\hat{j})+\lambda(2\hat{i}+\hat{j}+4\hat{k})$ is parallel to the plane $\vec{r}.(-2\hat{i}+\hat{k})=5$ .Also find the distance between the line and the plane.
Q.26	A die is thrown three times. Events A and B are defined as below: A : 4 on the third throw

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	B : 6 on the first and 5 on the second throw .Find the probability of A given that B has already occurred.
	PART – C (Question 27 to 32 carry 4 mark each.)
Q.27	Let $f,g:R\to R$ be two functions defied as $f(x)=\lvert x\rvert+x$ & $g(x)=\lvert x\rvert-x\ \forall x\in R$ then find fog and gof .
Q.28	Determine the values of a & b for which the function $f(x)=\begin{cases}\frac{\sin(a+1)x+2\sin x}{x}, for x<0\\ 2, for x=0\\ \frac{\sqrt{1+bx}-1}{x}, for x>0\end{cases}$ is continuous at x = 0 . **OR** If $(a+bx)e^{y/x}=x$, then prove that $x^3\frac{d^2y}{dx^2}=\left(x\frac{dy}{dx}-y\right)^2$.
Q.29	Show that the differential equations $\left\{x\cos\left(\frac{y}{x}\right)+y\sin\left(\frac{y}{x}\right)\right\}ydx=\left\{y\sin\left(\frac{y}{x}\right)-x\cos\left(\frac{y}{x}\right)\right\}xdy$ is homogeneous and solve it .
Q.30	Evaluate : $\int_0^{\pi/4}\frac{\sin x\cos x}{1+\sin 4x}dx$. **OR** Evaluate : $\int\frac{x^2}{x^4+x^2-2}dx$.

Q.31	Bag A contains 4 red and 5 black balls, while bag B has 3 red and 7 black balls. One ball is drawn from bag A and two from bag B. Find the probability that out of the three balls drawn, two are red and one is black. **OR** A doctor is to visit a patient. From the past experience, it is known that the probabilities that he will come by train, bus, scooter or by other means of transport are respectively $\frac{3}{10},\frac{1}{5},\frac{1}{10}\&\frac{2}{5}$. The probabilities that he will be late are $\frac{1}{4},\frac{1}{3}\&\frac{1}{12}$ if he comes by train, bus and scooter respectively, but if he comes by other means of transport, then he will not be late. When he arrives, he is late. What is the probability that he comes by train?
Q.32	A manufacturing company makes two models A and B of a product. Each piece of model A requires 9 hours of labor for fabricating and 1 hour for finishing. Each piece of model B requires 12 hours of labour for fabricating and 3 hours for finishing. The maximum number of labor hours, available for fabricating and for finishing, are 180 and 30 respectively. The company makes a profit of Rs 8000 and 12000 on each piece of model A and model B respectively. How many piece of each model should be manufactured to get maximum profit? Also, find the maximum profit .
	PART – D (Question 33 to 36 carry 6 mark each.)
Q.33	Prove , using properties of determinants: $\begin{vmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} = 4a^2b^2c^2$.

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	OR If $A=\begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$, prove that $A^3-6A^2-7A+2I=O$. Hence find A^{-1} .
Q.34	Using integration, find the area bounded by the curves y = |x – 1| & $y=3-\|x\|$.
Q.35	Find the equation of tangents to the curve $y = \cos(x+y)$, $-2\pi\langle x\langle 2\pi$ that are parallel to the line $x + 2y = 0$. **OR** An isosceles triangle of vertical angle 2θ is inscribed in a circle of radius a. Show that the area of triangle is maximum when $\theta = \frac{\pi}{6}$.
Q.36	Fine the equation of the plane through the point (4,-3,2) and perpendicular to the line of intersection of the planes x-y+2z-3=0 and 2x-y-3z = 0. Find the point of intersection of the line $\vec{r}=\hat{i}+2\hat{j}-\hat{k}+\lambda(\hat{i}+3\hat{j}-9\hat{k})$ and the plane obtained above.
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	जो आपने सीखा है उसे भूल जाने के बाद जो रह जाता है वो शिक्षा है.