CODE:TMC- AG-PB-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 The determinant $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0$, if a, b, c are in

(a) A. P. (b) G. P. (c) H. P. (d)None of these

Q.2 If $\begin{bmatrix} 3 & 1 \\ 4 & 1 \end{bmatrix} X = \begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix}$, then $X =$

(a) $\begin{bmatrix} -3 & 4 \\ 14 & -13 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -4 \\ -14 & 13 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 4 \\ 14 & 13 \end{bmatrix}$ (d) $\begin{bmatrix} -3 & 4 \\ -14 & 13 \end{bmatrix}$

Q.3 If three vectors $\mathbf{a} = 12\mathbf{i} + 4\mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = 8\mathbf{i} - 12\mathbf{j} - 9\mathbf{k}$ and $\mathbf{c} = 33\mathbf{i} - 4\mathbf{j} - 24\mathbf{k}$ represents a cube, then its volume will be

(a) 616 (b) 308 (c) 154 (d) None of these

Q.4 If the product of distances of the point (1, 1, 1) from the origin and the plane $x - y + z + k = 0$ be 5, then $k =$

(a) -2 (b) -3 (c) 4 (d) 7

Q.5 The minimum value of $z = 2x_1 + 3x_2$ subject to the constraints $2x_1 + 7x_2 \ge 22$, $x_1 + x_2 \ge 6$, $5x_1 + x_2 \ge 10$ and $x_1, x_2 \ge 0$ is (a)14 (b) 20 (c) 10 (d) 16

Q.6 If $\tan^{-1}(x-1) + \tan^{-1}x + \tan^{-1}(x+1) = \tan^{-1}3x$, then $x =$

	(a) $\pm\frac{1}{2}$ (b) $0,\frac{1}{2}$ (c) $0,-\frac{1}{2}$ (d) $0,\pm\frac{1}{2}$
Q.7	If a plane meets the co-ordinate axes at *A*,*B* and *C* such that the centroid of the triangle is (1, 2, 4) then the equation of the plane is (a) $x+2y+4z=12$ (b) $4x+2y+z=12$ (c) $x+2y+4z=3$ (d) $4x+2y+z=3$
Q.8	$\int \cos^3 x\, e^{\log(\sin x)}\, dx$ is equal to (a) $-\frac{\sin^4 x}{4}+c$ (b) $-\frac{\cos^4 x}{4}+c$ (c) $\frac{e^{\sin x}}{4}+c$ (d) None of these
Q.9	Image point of $(1,3,4)$ in the plane $2x-y+z+3=0$ is (a) (– 3, 5, 2) (b)(3, 5, – 2) (c)(3, – 5, 3) (d)None of these
Q.10	The co-ordinates of the foot of the perpendicular drawn from the origin to a plane is (2, 4, –3). The equation of the plane is (a) $2x-4y-3z=29$ (b) $2x-4y+3z=29$ (c) $2x+4y-3z=29$ (d)None of these
	Fill in the blanks (Q11 – Q15)
Q.11	If $f(x)=\frac{2x+1}{3x-2}$, then $(fof)(2)$ is equal to--------------
Q.12	Tthe value of constant k = …….. so that the given function is continuous at the indicate point; $f(x)=\begin{cases}\frac{x^2-25}{x-5}, & x\neq 5\\ k; & x=5\end{cases}$ at x = 5 .
Q.13	If $A=\begin{bmatrix}4 & 3\\ 2 & 5\end{bmatrix}$, find (x , y) =……. such that $A^2-xA+yI=0$.

Q.14	A particle moves along the curve $6y=x^3+2$. find the points on the curve at which the y-coordinate is changing 8 times as fast as x-coordinate. OR Using Lagrange's mean value theorem , find a point on the curve $y=\sqrt{x-2}$ defined on the interval [2, 3] , where the tangent is parallel to the chord joining the end points of the curve .
Q.15	The value of $i\bullet(2j\times 3k)-4j\bullet(3k\times i)+k\bullet(i\times 5j)=----$. **OR** the area of the triangle formed by O,A,B when $\vec{OA}=\hat{i}+2\hat{j}+3\hat{k}, \vec{OB}=-3\hat{i}-2\hat{j}+\hat{k}$. is -----------
	(Q16 - Q20) Answer the following questions
Q.16	If $A=\begin{bmatrix}0 & i\\ i & 1\end{bmatrix}$ and $B=\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$, find the value of $\lvert A\rvert+\lvert B\rvert$.
Q.17	Evaluate: $\int_0^{\frac{\pi}{2}} \lvert\sin x-\cos x\rvert dx$.
Q.18	Evaluate: $\int \frac{1}{\sqrt{1-e^{2x}}}dx$.
Q.19	Evaluate: $\int \frac{(\sin x - x\cos x)dx}{x(x+\sin x)}$. **OR** Evaluate: $\int \frac{dx}{\sqrt{\sin^3 x \sin(x+\alpha)}}$.

Q.20 Order and degree of the differential equation $\frac{d^2y}{dx^2} = \left\{ y + \left(\frac{dy}{dx}\right)^2 \right\}^{1/4}$.

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

Q.21 If $\cos^{-1}\frac{x}{a} + \cos^{-1}\frac{y}{b} = \alpha$ prove that $\frac{x^2}{a^2} - \frac{2xy}{ab}(\cos\alpha) + \frac{y^2}{b^2} = \sin^2\alpha$.

OR

Determine the nature of the functions $f(x) = \log(x + \sqrt{x^2+1})$ for even and odd.

Q.22 If $y = \tan^{-1}\left(\frac{5ax}{a^2 - 6x^2}\right)$, prove that $\frac{dy}{dx} = \frac{3a}{a^2+9x^2} + \frac{2a}{a^2+4x^2}$.

Q.23 Find the approximate value of a if $a^3 - 7 = 0$.

Q.24 If $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} + 3\hat{k}$, find the value of λ so that $\vec{a}+\vec{b}$ is perpendicular to $\vec{a}-\vec{b}$.

OR

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 and vector) components of $\vec{a}$ along the axes.

Q.25 Find the value of λ for which the points with position with position vectors $\hat{i} - \hat{j} + 3\hat{k}$ and $3\hat{i} + \lambda\hat{j} + 3\hat{k}$ are equidistant from the plane $\vec{r}\cdot(5\hat{i} + 2\hat{j} - 7\hat{k}) + 9 = 0$.

Q.26 If $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular vectors of equal magnitudes, find the angles which the vector $2\vec{a} + \vec{b} + 2\vec{c}$ makes with the vector $\vec{a}, \vec{b}$ and $\vec{c}$.

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

Q.27 Check whether the relation R in R defined by $R = \{(a,b) : a \le b^3\}$ is reflexive, symmetric or transitive.

Q.28 Show that $xy = ae^x + be^{-x} + x^2$ is a solution of the differential equation $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - xy + x^2 - 2 = 0$.

OR

If $x^y + y^x + x^x = a^b$ find dy/dx.

Q.29 Solve the following differential equation: $\sqrt{1+x^2+y^2+x^2y^2} + xy\frac{dy}{dx} = 0$

Q.30 Evaluate: $\int_0^{\pi} \frac{x}{4 - \cos^2 x}dx$.

OR

Evaluate: $\int e^{2x}.\sin(3x+1)dx$.

Q.31 Find the equations of the two lines through the origin with intersect the line $\frac{x-3}{2} = \frac{y-3}{1} = \frac{z}{1}$ at angle of $\frac{\pi}{3}$.

	OR If line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then find the value of k and hence find the equation of the plane containing these lines.
Q.32	A farmer mixes two brands P and Q of cattle feed. Brand P, costing Rs 250 per bag contains 3 units of nutritional element A, 2.5 units of element B and 2 units of element C. Brand Q costing Rs 200 per bag contains 1.5 units of nutritional elements A, 11.25 units of element B, and 3 units of element C. The minimum requirements of nutrients A, B and C are 18 units, 45 units and 24 units respectively. Determine the number of bags of each brand which should be mixed in order to produce a mixture having a minimum cost per bag? What is the minimum cost of the mixture per bag?
	PART – D (Question 33 to 36 carry 6 mark each.)
Q.33	Prove that : $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(b+c)(c+a)(a+b)$. **OR** If $A=\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$, find A^{-1} and use it to solve the system of equations: x + y + 2z = 0; x + 2y – z = 9; x – 3y + 3z = - 14 .
Q.34	Using integration, find the area of the triangle bounded by the lines 11 = 7x - 2y , 19 = 3x + 2y and x – y = 3.

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Q.35	Find the area of the greatest isosceles triangle that can be inscribed in a given ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ having its vertex coinciding with one extremity of major axis. **OR** A wire of length 28m is to be cut into two pieces. One of the pieces is to be made into a square and the other into a circle . What should be the lengths of the two pieces, so that the combined area of the square and the circle is minimum ?
Q.36	A variable plane which remains at a constant distance of 3p units from the origin, cuts the coordinate axes at the points A, B and C. Show that the locus of the centroid of triangle ABC is $x^{-2}+y^{-2}+z^{-2}=p^{-2}$.
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	सपने वो नहीं है जो हम नींद में देखते है, सपने वो है जो हमको नींद नहीं आने देते।