CODE:REV- AG-PB-1

पजियन क्रमांक REG.NO:-TMC -D/79/89/36

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.

PRE-BOARD EXAMINATION 2019 -20

Time : 3 Hours | Maximum Marks : 80

CLASS – XII | **MATHEMATICS**

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

SECTION I : Single correct answer type

This section contain 10 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) $\begin{bmatrix} -3 & 4 \\ -14 & 13 \end{bmatrix}$

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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 $2x_1 + 7x_2 \geq 22$, $x_1 + x_2 \geq 6$, $5x_1 + x_2 \geq 10$ & $x_1, x_2 \geq 0$ 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	The chances to fail in Physics are 20% and the chances to fail in Mathematics are 10%. What are the chances to fail in at least one subject (a) 28% (b) 38% (c) 72% (d) 82%
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
(Q11 – Q15) Answer the following questions	
Q.11	If $A = \begin{bmatrix} 0 & i \\ i & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, find the value of $\|A\| + \|B\|$.

Q.12	Evaluate: $\int_{0}^{\frac{\pi}{2}} \lvert \sin x - \cos x \rvert dx$.
Q.13	Evaluate: $\int \frac{1}{\sqrt{1-e^{2x}}} dx$.
Q.14	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.15	Order and degree of the differential equation $\frac{d^2y}{dx^2} = \left\{ y + \left(\frac{dy}{dx}\right)^2 \right\}^{1/4}$.
Fill in the blanks (Q16 – Q20)	
Q.16	If $f(x) = \frac{2x+1}{3x-2}$, then $(fof)(2)$ is equal to--------------
Q.17	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.18	If $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, find (x , y) =……. such that $A^2 - xA + yI = 0$.
Q.19	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.20	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 -----------
	PART – B (Question 21 to 26 carry 2 mark each.)
Q.21	If $a > b > c > 0$, prove that $\cot^{-1}\left(\frac{1+ab}{a-b}\right)+\cot^{-1}\left(\frac{1+bc}{b-c}\right)+\cot^{-1}\left(\frac{1+ca}{c-a}\right)=\pi$. **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	A bag contains5 red and 2 black balls. Two balls are drawn one by one without replacement . Let X represent the number of black balls drawn . What are the possible value of X ?
	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: $\sqrt{1+x^2+y^2+x^2y^2} + \text{x y}\dfrac{dy}{dx} = 0$
Q.30	Evaluate: $\displaystyle\int_0^{\pi} \frac{x}{4-\cos^2 x}\,dx.$ **OR** Evaluate: $\displaystyle\int e^{2x}.\sin(3x+1)dx$.
Q.31	Given three identical boxes I, II and III, each containing two coins. In box I, both coins are gold coins, in box II, both are silver coins and in the box III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold? **OR** In Aniket's school, annual sports meets with the title sports 'for healthy life ' was being organized . On the last day of the meet there was the event of hurdle race,it was decided that, a player has to cross 10 hurdles . The probability that he will clear each hurdle is 5 / 6 .What is the probability that he will knock down fewer than 2 hurdles ? On the same day, a press release was also to be given in newspaper regarding the event , with the importance of sports for healthy life . You are to given some points which highlight the importance of sports for healthy life?
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**

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	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.
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 $x^{-2}+y^{-2}+z^{-2}=p^{-2}$.
	" THE TWO MOST POWERFUL WARRIORS ARE PATIENCE AND TIME "