CODE:0202- AG-TS-05 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 A is a $n \times n$ matrix, then adj(adj A)= (a) $\|A\|^{n-1}A$ (b) $\|A\|^{n-2}A$ (c) $\|A\|^{n}$ (d)None of these
Q.2	If D = $\begin{vmatrix} 1 & 2 & 3 \\ 2 & -1 & 0 \\ 3 & 4 & 5 \end{vmatrix}$, then $\begin{vmatrix} 1 & 6 & 3 \\ 4 & -6 & 0 \\ 3 & 12 & 5 \end{vmatrix}$ is equal to a . 6D b. 3D c. 0 d. 2D
Q.3	The area of a parallelogram whose two adjacent sides are represented by the vector $3\mathbf{i}-\mathbf{k}$ and $\mathbf{i}+2\mathbf{j}$ is (a) $\frac{1}{2}\sqrt{17}$ (b) $\frac{1}{2}\sqrt{14}$ (c) $\sqrt{41}$ (d) $\frac{1}{2}\sqrt{7}$
Q.4	Two coins are tossed once, where E : tail appears on one coin, F : one coin shows head. Find P(E/F) a. 0.24 b. 0.33 c. 1 d. 0.23
Q.5	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.6	If $3\sin^{-1}\frac{2x}{1-x^2}-4\cos^{-1}\frac{1-x^2}{1+x^2}+2\tan^{-1}\frac{2x}{1-x^2}=\frac{\pi}{3}$ then x = (a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) 1 (d) None of these
Q.7	Three ships A, B and C sail from England to India. If the ratio of their arriving safely are 2 : 5, 3 : 7 and 6 : 11 respectively then the probability of all the ships for arriving safely is

	(a) $\frac{18}{595}$ (b) $\frac{6}{17}$ (c) $\frac{3}{10}$ (d) $\frac{2}{7}$
Q.8	$\int \sec x \tan^3 x\, dx =$ (a) $\frac{1}{3}\sec^3 x - \sec x + c$ (b) $\sec^3 x - \sec x + c$ (c) $\frac{1}{3}\sec^3 x + \sec x + c$ (d)None of these
Q.9	The maximum value of $z = 5x + 2y$, subject to the constraints $x + y \le 7, x + 2y \le 10$, $x, y \ge 0$ is (a) 10 (b) 26 (c) 35 (d) 70
Q.10	The equation of the plane through (2, 3, 4) and parallel to the plane $x + 2y + 4z = 5$ is (a) $x + 2y + 4z = 10$ (b) $x + 2y + 4z = 3$ (c) $x + y + 2z = 2$ (d) $x + 2y + 4z = 24$

Fill in the blanks (Q11 – Q15)

Q.11	Total number of injective functions from set A and set B, where A = {1, 2, 3}, B ={a, b, c} is -------
Q.12	The values of (a , b)= ………if f(x) = $\begin{cases} 2ax + b, x < 2 \\ 19, x = 2 \\ 3a - 2bx, x > 2 \end{cases}$ is continuous at x = 2.
Q.13	$\begin{vmatrix} x-3 & x-4 & x-\alpha \\ x-2 & x-3 & x-\beta \\ x-1 & x-2 & x-\gamma \end{vmatrix} =$…….. ,where α, B, γ are in AP.

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Q.14	If $f(x) = \cos x, 0 \le x \le \frac{\pi}{2}$, then the real number 'c' of the mean value theorem is (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\sin^{-1}\left(\frac{2}{\pi}\right)$ (d) $\cos^{-1}\left(\frac{2}{\pi}\right)$ OR The function $f(x) = \tan^{-1}(\sin x + \cos x)$, $x > 0$ is always an increasing function on the interval (a) $(0, \pi)$ (b) $(0, \pi/2)$ (c) $(0, \pi/4)$ (d) $(0, 3\pi/4)$
Q.15	If $\vec{a}$ and $\vec{b}$ are two non-collinear unit vectors such that $\left\|\vec{a} + \vec{b}\right\| = \sqrt{3}$, find $(2\vec{a} - 5\vec{b}).(3\vec{a} + \vec{b})$. **OR** If $\left\|\vec{a}\right\| = \sqrt{3}, \left\|\vec{b}\right\| = 2$ and $\vec{a} \bullet \vec{b} = \sqrt{3}$ find $\left\|\vec{a} \times \vec{b}\right\|$.

(Q16 - Q20) Answer the following questions

Q.16	If $A = \begin{bmatrix} 2 & -3 & -5 \\ -1 & 4 & 5 \\ 1 & -3 & -4 \end{bmatrix}$, show that $A^2 = A$. Also write the name of matrix. .
Q.17	Evaluate: $\int_{-\pi/2}^{\pi/2} \log\left(\frac{2-\sin x}{2+\sin x}\right) dx.$
Q.18	Evaluate: $\int \sqrt{\frac{1-x}{x}}\, dx$.

Q.19	Evaluate: $\int \frac{2^x dx}{\sqrt{1-4^x}}$ **OR** Evaluate: $\int \frac{xdx}{1-x^4}$
Q.20	Solve : $cox(1+\cos y)dx - \sin y(1+\sin x)dy = 0$.

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

Q.21	If $x = \operatorname{cosec}\left[\tan^{-1}\left\{\cos\left(\cot^{-1}\sec\left(\sin^{-1}a\right)\right)\right\}\right]$ and $y = \sec\left[\cot^{-1}\left\{\sin\left(\tan^{-1}\operatorname{cosec}\left(\cos^{-1}a\right)\right)\right\}\right]$, then find a relation between x and y in terms of a. **OR** Let relation $R = \{(x,y) \in w \times w : y = 2x - 4\}$. If (a , 2) and $(4, b^2)$ belong to relation R, find the value of a and b .
Q.22	If $x^y = y^x$, prove that $\frac{dy}{dx} = \frac{y(x\log y - y)}{x(y\log x - x)}$.
Q.23	Find the rate of the area of a circular disc with respect to its circumference when the radius is 8 cm.
Q.24	Find the value of x for which the angle between the vectors $\vec{a} = 2x^2 i + 4xj + k$ & $\vec{b} = 7i - 2j + xk$ is obtuse. **OR** Show that the projection vector of $\vec{a}$ on $\vec{b}(\neq \vec{0})$ (component of $\vec{a}$ along $\vec{b}$) is $\left(\frac{\vec{a}\cdot\vec{b}}{\lvert\vec{b}\rvert^2}\right)\vec{b}$
Q.25	Find the value of c and d if the plane 2x + 4y –cz + d = 0 will contain the line $\frac{x-1}{2} = \frac{y-3}{1} = \frac{z-1}{4}$.
Q.26	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.

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

Q.27	Prove that the function $f:[0,\infty] \to R$ Given by $f(x) = 9x^2 + 6x - 5$ is not invertible. Modify the co-domain of the function f to make it invertible, and hence find f^{-1}.
Q.28	If $x = y + \cfrac{1}{y + \cfrac{1}{y + ------\infty}}$, prove that $\frac{dy}{dx} = 2x^2 + y^2 - 3xy$. **OR** If $y = (x + \sqrt{1+x^2})^n$ prove that $(1+x^2)\frac{d^2y}{dx^2} + x.\frac{dy}{dx} = n^2 y$.
Q.29	Solve the following differential equation, given that y = 0, when $x = \frac{\pi}{4}$: $\sin 2x \frac{dy}{dx} - y = \tan x$
Q.30	If $f(x)$ is a continuous function defined on $[0,2a]$, *then* prove that

	$\int_0^{2a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx, & if\ f(2a-x)=f(x) \\ 0 & ,if\ f(2a-x)=-f(x) \end{cases}$. **OR** Evaluate: $\int \left(1+x-\frac{1}{x}\right)e^{x+\frac{1}{x}}dx$
Q.31	Two numbers are selected at random (without replacement) from positive integers 2, 3, 4, 5, 6 and 7. Let X denotes the larger of the two numbers obtained. Find the mean and variance of the probability distribution of X. **OR** A bag A contains 4 black and 6 red balls and bag B contains 7 black and 3 red balls. A die is thrown. If 1 or 2 appears on it, then bag A is chosen, otherwise bag B. If two balls are drawn at random (without replacement) from the selected bag, find the probability of one of them being red and another black.
Q.32	A factory makes tennis rackets and cricket bats. A tennis racket takes 1.5 hours of machine time and 3 hours of craftsman's time in its making while a cricket bat takes 3 hour of machine time and 1 hour of craftsman's time. In a day, the factory has the availability of not more than 42 hours of machine time and 24 hours of craftsman's time. (i) What number of rackets and bats must be made if the factory is to work at full capacity? (ii) If the profit on a racket and on a bat is Rs 20 and Rs 10 respectively, find the maximum profit of the factory when it works at full capacity.
	PART – D (Question 33 to 36 carry 6 mark each.)
Q.33	Using integration, find the area lying above x-axis and included between the circle $x^2+y^2=8x$ and exterior of the parabola $y^2=4x$.

Q.34	If $p\neq0, q\neq0$ and $\begin{vmatrix} p & q & p\alpha+q \\ q & r & q\alpha+r \\ p\alpha+q & q\alpha+r & 0 \end{vmatrix}=0$, then, using properties of determinants, prove that at least one of the following statements is true (a) P,q,r, are in G.P.,(b) α is a root of the equation $px^2+2qx+r=0$. **OR** If $A=\begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$, Using elementary row transformation find A^{-1}. Hence, solve the system of equations: $3x+3y+2z=1; x+2y=4; 2x-3y-z=5$.
Q.35	A helicopter is flying along the curve $y=x^2+2$. A soldier is placed at the point (3, 2). Find the nearest distance between the soldier and the helicopter. **OR** A magazine seller has 500 subscribers and collects annual subscription charges of Rs, 300 per subscriber. She proposes to increase the annual subscription charges and it is believed that for every increase of Re 1, one subscriber will discontinue. What increase will bring maximum income to her ?
Q.36	Find the image p' of the point P having position vector $\hat{i}+3\hat{j}+4\hat{k}$ in the plane $\vec{r}.\left(2\hat{i}-\hat{j}+\hat{k}\right)+3=0$. Hence find the length of PP'.
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	सब जानते हैं समय कीमती है, फिर इसे दूसरों की बुराई में क्यों व्यर्थ गंवाना?