**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** Inverse of the matrix $\begin{bmatrix} 3 & -2 & -1 \\ -4 & 1 & -1 \\ 2 & 0 & 1 \end{bmatrix}$ is

(a) $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 3 & 7 \\ -2 & -4 & -5 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -3 & 5 \\ 7 & 4 & 6 \\ 4 & 2 & 7 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 2 & -4 \\ 8 & -4 & -5 \\ 3 & 5 & 2 \end{bmatrix}$

**Q.2** The matrix $\begin{bmatrix} 2 & \lambda & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is non singular, if

(a) $\lambda \neq -2$ (b) $\lambda \neq 2$ (c) $\lambda \neq 3$ (d) $\lambda \neq -3$

**Q.3** If $\mathbf{a} = 2\mathbf{i} + \mathbf{j} + 2\mathbf{k}$ and $\mathbf{b} = 5\mathbf{i} - 3\mathbf{j} + \mathbf{k}$, then the projection of $\mathbf{b}$ on $\mathbf{a}$ is

(a) 3 (b) 4 (c) 5 (d) 6

**Q.4** If a dice is thrown 7 times, then the probability of obtaining 5 exactly 4 times is

(a) ${}^7C_4\left(\frac{1}{6}\right)^4\left(\frac{5}{6}\right)^3$ (b) ${}^7C_4\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^4$ (c) $\left(\frac{1}{6}\right)^4\left(\frac{5}{6}\right)^3$ (d) $\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^4$

**Q.5** Equation of $x$-axis is

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| | (a) $\frac{x}{1}=\frac{y}{1}=\frac{z}{1}$ (b) $\frac{x}{0}=\frac{y}{1}=\frac{z}{1}$ (c) $\frac{x}{1}=\frac{y}{0}=\frac{z}{0}$ (d) $\frac{x}{0}=\frac{y}{0}=\frac{z}{1}$ |
| **Q.6** | If $\cos^{-1}p+\cos^{-1}q+\cos^{-1}r=\pi$ then $p^2+q^2+r^2+2pqr=$ <br> (a) 3 (b) 1 (c) 2 (d) −1 |
| **Q.7** | The probability that a man will be alive in 20 years is $\frac{3}{5}$ and the probability that his wife will be alive in 20 years is $\frac{2}{3}$. Then the probability that at least one will be alive in 20 years, is <br> (a) $\frac{13}{15}$ (b) $\frac{7}{15}$ (c) $\frac{4}{15}$ (d) None of these |
| **Q.8** | $\int \frac{\sin 2x}{\sin^4 x+\cos^4 x}dx=$ <br> (a) $\cot^{-1}(\tan^2 x)+c$ (b) $\tan^{-1}(\tan^2 x)+c$ <br> (c) $\cot^{-1}(\cot^2 x)+c$ (d) $\tan^{-1}(\cot^2 x)+c$ |
| **Q.9** | 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 <br> (a) Parallel lines (b) Intersecting at $60°$ (c) Skew lines (d) Intersecting at right angle |
| **Q.10** | Let $f(x)=\begin{cases}\frac{x-4}{\lvert x-4\rvert}+a, & x<4\\ a+b, & x=4\\ \frac{x-4}{\lvert x-4\rvert}+b, & x>4\end{cases}$. Then $f(x)$ is continuous at $x=4$ when <br> (a) $a=0,b=0$ (b) $a=1,b=1$ (c) $a=-1,b=1$ (d) $a=1,b=-1$ |

## Fill in the blanks (Q11 – Q15)



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| **Q.11** | Total number of bijective functions from set A and set B, where A = {1, 2, 3}, B = {a, b, c, d} is ……….. |
| **Q.12** | The point at which the line joining the points (2, −3, 1) and (3, −4, −5) intersects the plane $2x+y+z=7$ is ……. |
| **Q.13** | For what value of k = ………, the matrix $\begin{pmatrix}2k+3 & 4 & 5\\ -4 & 0 & -6\\ -5 & 6 & -2k-3\end{pmatrix}$ is skew symmetric ? |
| **Q.14** | Values of x is ………………..the rate of increase of $x^3-5x^2+5x+8$ is twice the rate of increase of x? <br> OR <br> The angle of intersection of the following curves $y^2=4x$ & $x^2=4y$ is …… |
| **Q.15** | The point of intersection of the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z+2}{3}$ and the plane $2x+3y+z=0$ is ……… <br> **OR** <br> Let $\vec{a}=\hat{i}+\hat{j}+\hat{k},\ \vec{b}=\hat{i}$ and $\vec{c}=c_1\hat{i}+c_2\hat{j}+c_3\hat{k}$ then Let $c_1=1$ and $c_2=2$, find $c_3$ which makes $\vec{a},\vec{b}$ and $\vec{c}$ coplanar. |

## (Q16 - Q20) Answer the following questions

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| **Q.16** | If the value of third order determinant is 12, than find the value of the determinant formed by its cofactors . |
| **Q.17** | Evaluate $\int_{-1}^{1} x\lvert x\rvert dx$. |
| **Q.18** | Evaluate: $\int \frac{1}{x^3(x^5+1)^{3/5}}dx$. |

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| **Q.19** | Evaluate: $\int \frac{\sin 2x dx}{\sin(x-p)\sin(x+p)}$ <br> OR <br> Evaluate: $\int \frac{(\sin x - x\cos x)dx}{x(x+\sin x)}$ |
| **Q.20** | Find the value of m and n, where m and n are order and degree of differential equation $\frac{4\left(\frac{d^2y}{dx^2}\right)^3}{\frac{d^3y}{dx^3}} + \frac{d^3y}{dx^3} = x^2 - 1$. |

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

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| **Q.21** | Prove that : $2\tan^{-1}\frac{1}{5} + \sec^{-1}\frac{5\sqrt{2}}{7} + 2\tan^{-1}\frac{1}{8} = \frac{\pi}{4}$. <br> **OR** <br> Solve the following for x: $\tan^{-1}\left(\frac{x-5}{x-6}\right) + \tan^{-1}\left(\frac{x+5}{x+6}\right) = \frac{\pi}{4}$. |
| **Q.22** | Show that $y = \operatorname{cosec}^{-1} x$ is a solution of the differential equation $x\left(x^2-1\right)\frac{d^2y}{dx^2} + \left(2x^2-1\right)\frac{dy}{dx} = 0$ |
| **Q.23** | Find the interval in which f(x) = sin 3x – cos 3x , $x \in (0,\pi)$, is strictly increasing or strictly decreasing . |
| **Q.24** | Write the equation of the plane containing the lines $\vec{r} = \vec{a} + \lambda\vec{b}$ & $\vec{r} = \vec{a} + \mu\vec{c}$ . |



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| | **OR** <br> Find the coordinates of the point where the line through (5, 1, 6) and (3, 4, 1) crosses the YZ-plane. |
| **Q.25** | Find the values of 'a' for which the vector $\vec{r} = (a^2-4)i + 2j - (a^2-9)k$ makes acute angles with the coordinate axes. |
| **Q.26** | A card is drawn from a well shuffled pack of 52 cards. The outcome is noted and pack is again Reshuffled without replacing the card. Another card is then drawn. What is the probability that the first card is a spade and second is a black king. |

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

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| **Q.27** | 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.28** | If $y = \frac{x\sin^{-1}x}{\sqrt{(1-x^2)}} + \log\sqrt{1-x^2}$. Prove that $\frac{dy}{dx} = \frac{\sin^{-1}x}{(1-x^2)^{3/2}}$ <br> **OR** <br> Is f (x) = $\lvert x-1\rvert + \lvert x-2\rvert$ continuous and differentiable at x = 1,2 . |
| **Q.29** | Find the particular solution of the differential equation $\frac{dy}{dx} + y\cot x = 2x + x^2\cot x\,(x \neq 0)$ given that y(0)= $x = \frac{\pi}{2}$. |
| **Q.30** | Evaluate: $\int \frac{e^{\tan^{-1}x}}{\left(1+x^2\right)^2}dx$ . <br> **OR** <br> Evaluate : $\int (2\sin 2x - \cos x)\left(\sqrt{6-\cos^2 x - 4\sin x}\right)dx$ |

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| **Q.31** | In a shop X, 30 tins of pure ghee and 40 tins of adulterated ghee which look alike, are kept for sale while in shop Y, similar 50 tins of pure ghee and 60 tins of adulterated ghee are there. One tin of ghee is purchased from one of the randomly selected shops and is found to be adulterated. Find the probability that it is purchased from shop Y. **OR** If A and B are two independent events such that $P(\overline{A} \cap B) = \frac{2}{15}$ and $P(A \cap \overline{B}) = \frac{1}{6}$, find P (B) . |
| **Q.32** | A cooperative society of farmers has 50 hectare of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively. To control weeds, a liquid herbicide has to be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used in order to protect fish and wild life using a pond which collects drainage from this land. How much land should be allocated to each crop so as to maximize the total profit of the society? |
| | **PART – D** **(Question 33 to 36 carry 6 mark each.)** |
| **Q.33** | Using properties of determinants, prove that $\begin{vmatrix} \frac{(a+b)^2}{c} & c & c \\ a & \frac{(b+c)^2}{a} & a \\ b & b & \frac{(c+a)^2}{b} \end{vmatrix} = 2(a+b+c)^3$. |





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| | **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.34** | Using integration, find the area of the region bounded by the line $x - y + 2 = 0$ the curve $x = \sqrt{y}$ and y-axis. |
| **Q.35** | Show that the volume of the largest cone that can be inscribed in a sphere of radius R is 8 /27 of the volume of the sphere . |
| **Q.36** | Find the direction ratios of the normal to the plane, which passes through the points (1, 0, 0) and (0, 1, 0) and makes angle $\frac{\pi}{4}$ which the plane x + y = 3. Also find the equation of the plane. OR Show that the line of intersection of the planes x + 2y + 3z = 8 and 2x + 3y + 4z = 11 is coplanar with the line $\frac{x+1}{1} = \frac{y+1}{2} = \frac{z+1}{3}$. Also find the equation of the plane containing them. |
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| | सपने वो नहीं है जो हम नींद में देखते है, सपने वो है जो हमको नींद नहीं आने देते। |