CODE:0902- AG-TS-06 **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 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.2 If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$, is

(a) 1 (b) –1 (c) 4 (d) No real values

Q.3 If $|\mathbf{a}.\mathbf{b}| = 3$ and $|\mathbf{a} \times \mathbf{b}| = 4$, then the angle between **a** and **b** is

(a) $\cos^{-1}\frac{3}{4}$ (b) $\cos^{-1}\frac{3}{5}$ (c) $\cos^{-1}\frac{4}{5}$ (d) $\frac{\pi}{4}$

Q.4 'X' speaks truth in 60% and 'Y' in 50% of the cases. The probability that they contradict each other narrating the same incident is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

Q.5 In an LPP if the objective function Z= ax + by has the same maximum value on two corner points of the feasible region, then every point on the line segment joining these two points give the same

a.Upper limit value b. Minimum value

c. Maximum value d. Mean value

Q.6 If $4\sin^{-1}x + \cos^{-1}x = \pi$, then x is equal to

(a) 0 (b) $\frac{1}{2}$ (c) $-\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{2}}$

Q.7 A random variable X has the probability distribution

X	1	2	3	4	5	6	7	8
P(X)	0.15	0.23	0.12	0.10	0.20	0.08	0.07	0.05

For the events $E = \{X$ is prime number$\}$ and $F = \{X < 4\}$, the probability of $P(E \cup F)$ is

(a) 0.50 (b) 0.77 (c) 0.35 (d) 0.87

Q.8 $\int \frac{e^{-x}}{1+e^{x}}\,dx =$

(a) $\log(1+e^{x}) - x - e^{-x} + c$ (b) $\log(1+e^{x}) + x - e^{-x} + c$

(c) $\log(1+e^{x}) - x + e^{-x} + c$ (d) $\log(1+e^{x}) + x + e^{-x} + c$

Q.9 Equation of x-axis is

(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.10 The perpendicular distance of the point (2, 4, –1) from the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$ is

(a) 3 (b) 5 (c) 7 (d) 9

Fill in the blanks (Q11 – Q15)

Q.11 The total number of on to function from set A to A if A={1,2,3, ……n}is ----------

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Q.12 Let $f(x) = \begin{cases} \frac{1-\cos 4x}{x^{2}}, & if x < 0 \\ a, & if x = 0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}-4}, & if x > 0 \end{cases}$ The value of a = …….

so that $f(x)$ is continuous at x = 0 .

Q.13 If $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix} = \begin{pmatrix} 7 & 11 \\ k & 23 \end{pmatrix}$, then write the value of k= ……

Q.14 Find the slop of tangent and normal to the curve $y = (\sin 2x + \cot x + 6)^{2}$, at $x = \frac{\pi}{2}$.

OR

If Rolle's Theorem are verified for the function f, given by f(x) = $e^{x}(\sin x - \cos x)$ on $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$. Find c .

Q.15 If two vectors $\vec{a}$ and $\vec{b}$ are such that $|\vec{a}| = 2, |\vec{b}| = 1$ and $\vec{a}.\vec{b} = 1$, then $(3\vec{a} - 5\vec{b}).(2\vec{a} + 7\vec{b}) = ----$

OR

If $\vec{a} = x\hat{i} + 2\hat{j} - z\hat{k}$ and $\vec{b} = 3\hat{i} - y\hat{j} + \hat{k}$ are two equal vectors, then write the value of x+y+z.

(Q16 - Q20) Answer the following questions

Q.16	Without expanding prove that $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} = 0.$
Q.17	Evaluate: $\int_0^{2\pi} \frac{dx}{1+e^{\sin x}}$.
Q.18	Evaluate: $\int \frac{dx}{x\sqrt{x^6-1}}dx$
Q.19	Evaluate: $\int \frac{1}{x^2(x^4+1)^{3/4}}dx$ **OR** Evaluate: $\int \frac{dx}{e^x+e^{-x}}$
Q.20	Write the sum of the order and degree of the following differential equation : $\frac{d}{dx}\{(\frac{dy}{dx})^3\} = 0$.
	PART – B (Question 21 to 26 carry 2 mark each.)
Q.21	If $y = \cot^{-1}(\sqrt{\cos x}) - \tan^{-1}(\sqrt{\cos x})$ Prove that $\sin y = \tan^2 \frac{x}{2}$. **OR** Let A = {1, 2, 3…… 12} and R be the relation in $A \times A$ defined by $(a,b)R(c,d) \Leftrightarrow ad = bc$ for (a, b), (c, d)$\in A \times A$. Then the number of equivalence class [(2, 3)]
Q.22	If $y = \sin^{-1}\sqrt{1-x} + \cos^{-1}\sqrt{x}$, show that $\frac{dy}{dx} = -\frac{1}{\sqrt{x(1-x)}}$.

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Q.23	The side of a square in increasing at the rate of 0.2 cm/s. Find the rate of increase of the perimeter of the square .
Q.24	The two vector $\hat{j}+\hat{k}$ and $3\hat{i}-\hat{j}+4\hat{k}$ represent the two side vectors $\vec{AB}$ and $\vec{AC}$ respectively of triangle ABC. Find the length of the median through A. **OR** If $\vec{a} = i + j + k, \vec{b} = 4i - 2j + 3k$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$.
Q.25	Find the equation of the line passing through the point P(4, 6, 2) and the point of intersection of the line $\frac{x-1}{3} = \frac{y}{2} = \frac{z+1}{7}$ and the plane x + y – z = 8 .
Q.26	A bag contains 5 red balls and 3 black balls three balls are drawn one by one without replacement. What is the probability that at least one of the three balls be black if the first balls are red?
	PART – C (Question 27 to 32 carry 4 mark each.)
Q.27	Show that function $f : R \to \{x \in R : -1 < x < 1\}$ defined by f(x) = $f(x) = \frac{x}{1+\lvert x\rvert}, x \in R$,is one-one & onto function.
Q.28	If y = a cos (log x) + b sin (log x), then prove that $x^2y_2 + xy_1 + y = 0$. **OR** Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$.
Q.29	Find the particular solution of the differential equation

	$xe^{\frac{y}{x}} - y\sin(\frac{y}{x}) + x\frac{dy}{dx}\sin(\frac{y}{x}) = 0$, given that y=0, when x =1
Q.30	Evaluate $\int_{-1}^{2}(e^{3x} + 7x - 5)dx$ as a limit of sums. **OR** Evaluate: $\int \frac{x^2}{(x\sin x + \cos x)^2}\,dx$.
Q.31	Two cards are drawn successively without replacement from well shuffled pack of 52 cards. Find the probability distribution of the number of kings. Also, calculate the mean and variance of the distribution. **OR** A bag contain 4 balls . Two balls are drawn at random , and are found to be white . What is the probability that all balls are white ?
Q.32	A dealer in rural area wishes to purchase some sewing machines. He has only Rs. 57600 to invest and has space for at most 20 items. An electronic machine costs him Rs. 3600 and a manually operated machine costs Rs. 2400. He can sell an electronic machine at a profit of Rs. 220 and a manually operated machine at a profit of Rs. 180. Assuming that he can sell all the machines that he buys, how should he invest his money in order to maximize his profit ? Make it as a LPP and solve it graphically.
	PART – D (Question 33 to 36 carry 6 mark each.)
Q.33	Using properties of determinates, show that ΔABC is isosceles if: $\begin{vmatrix} 1 & 1 & 1 \\ 1+\cos A & 1+\cos B & 1+\cos C \\ \cos^2 A+\cos A & \cos^2 B+\cos B & \cos^2 C+\cos C \end{vmatrix} = 0$

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	OR Two schools P and Q want to award their selected students on the values of Discipline, Politeness and Punctuality. The school P wants to award Rs. x each, Rs. y each and Rs. z each for the three respective values to its 3, 2 and 1 students with a total award money of Rs. 1000. School Q wants to spend Rs. 1500 to award its 4, 1 and 3 students on the respective values) by giving the same award money for the three values as before). If the total amount of awards for one prize on each value is Rs. 600, using matrices, find the award money for each value.
Q.34	Find the area of the region bounded by the parabolas $y^2 = 6x$ & $x^2 = 6y$.
Q.35	Find the equation of the normal to the curve $x^2 = 4y$ which passes through the point (1,2).Also find the equation of corresponding tangent. **OR** A cylinder is such that the sum of its height and the circumference of its base is 10 cm . Find the maximum volume of cylinder .
Q.36	Find the equation of a plane passing though the line of intersection of the planes. $x+2y+3z=2$ & $x-y+z=3$ and at a distance of $\frac{2}{\sqrt{3}}$ units from the points (3, 1, –1) .
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	सपने वो नहीं है जो हम नींद में देखते है, सपने वो है जो हमको नींद नहीं आने देते।