CODE:2601- AG-TS-04 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**

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

PRE-BOARD EXAMINATION 2019 -20

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 Which of the following is incorrect

(a) $A^2 - B^2 = (A+B)(A-B)$ (b) $(A^T)^T = A$

(c) $(AB)^n = A^n B^n$, where A, B commute (d) $(A-I)(I+A) = O \Leftrightarrow A^2 = I$

Q.2 If the matrix $AB = O$, then

(a) $A = O$ or $B = O$ (b) $A = O$ and $B = O$

(c)It is not necessary that either $A = O$ or $B = O$ (d) $A \neq O, B \neq O$

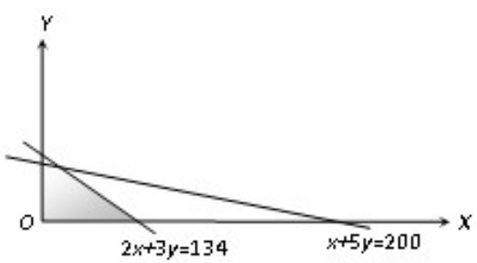
Q.3 A unit vector **a** makes an angle $\frac{\pi}{4}$ with z-axis. If $\mathbf{a}+\mathbf{i}+\mathbf{j}$ is a unit vector, then **a** is equal to

(a) $\frac{\mathbf{i}}{2}+\frac{\mathbf{j}}{2}+\frac{\mathbf{k}}{\sqrt{2}}$ (b) $\frac{\mathbf{i}}{2}+\frac{\mathbf{j}}{2}-\frac{\mathbf{k}}{\sqrt{2}}$ (c) $-\frac{\mathbf{i}}{2}-\frac{\mathbf{j}}{2}+\frac{\mathbf{k}}{\sqrt{2}}$ (d) None of these

Q.4 The probability of India winning a test match against West Indies is $\frac{1}{2}$. Assuming independence from match to match, the probability that in a 5 match series India's second win occurs at the third test, is

(a) $\frac{2}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{8}$

Q.5 The point of intersection of lines $\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{1}$ and

	$\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ is (a)(–1, –1, –1)(b)(–1, –1, 1)(c)(1, –1, –1)(d)(–1, 1, –1)
Q.6	If $\tan^{-1}2x+\tan^{-1}3x=\frac{\pi}{4}$, then $x=$ (a) -1 (b) $\frac{1}{6}$ (c) $-1,\frac{1}{6}$ (d) None of these
Q.7	A bag contains 3 black and 4 white balls. Two balls are drawn one by one at random without replacement. The probability that the second drawn ball is white, is (a) $\frac{4}{49}$ (b) $\frac{1}{7}$ (c) $\frac{4}{7}$ (d) $\frac{12}{49}$
Q.8	If $\int\frac{f(x)\,dx}{\log\sin x}=\log\log\sin x$, then $f(x)=$ (a) $\sin x$ (b) $\cos x$ (c) $\log\sin x$ (d) $\cot x$
Q.9	The minimum value of objective function $c=2x+2y$ in the given  feasible region, is (a) 134 (b) 40 (c) 38 (d) 80
Q.10	The angle between the lines $\frac{x}{1}=\frac{y}{0}=\frac{z}{-1}$ and $\frac{x}{3}=\frac{y}{4}=\frac{z}{5}$ is

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	(a) $\cos^{-1}\frac{1}{5}$ (b) $\cos^{-1}\frac{1}{3}$ (c) $\cos^{-1}\frac{1}{2}$ (d) $\cos^{-1}\frac{1}{4}$

Fill in the blanks (Q11 – Q15)

Q.11	For the set A = {1, 2, 3}, define a relation R in the set A as : R = (1, 1), (2, 2), (3,3) , (1,3)}. Then ordered pairs to be added to R to make it the smallest equivalence relation is ----------
Q.12	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 (a,b) = ……
Q.13	If A is a 3rd order matrix & $\lvert A\rvert=5$, then $\lvert 2AA^T\rvert$ = ----------
Q.14	The radius of circular soap bubble is increasing at the rate of 0.2 cm/s. The rate of increase of its surface area when the radius is 7 cm ---------- OR If total revenue received from the sale of X units of a product is given by R (x) = Rs. $\left(13^2+26x+17\right)$. Then the marginal revenue (MR) when x = 9 is ----------
Q.15	Vectors $\vec{a}$ and $\vec{b}$ are inclined at angle of $\theta=120^0$. Also it is known that $\lvert\vec{a}\rvert=1$ and $\lvert\vec{b}\rvert=2$ then, the value of $\left\lceil\left(\vec{a}+3\vec{b}\right)\times\left(3\vec{a}-\vec{b}\right)\right\rceil^2$ = ---------- **OR** Let $\vec{a}=i+j+k$, $b=i$ and $\vec{c}=c_2i+c_2j+c_3k$. Also let $c_2=-1$, Then the value show of c_1 = --------- can make $\vec{a}$, $\vec{b}$ and $\vec{c}$ coplanar .

(Q16 - Q20) Answer the following questions

Q.16 If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then det (adj (adj A)) .

Q.17 Evaluate $\int_1^2 x^{2x}(1+\log x)\,dx$.

Q.18 Evaluate : $\int \sqrt{e^x - 1}\,dx$

Q.19 Evaluate : $\int_0^{\pi/2} \left(\frac{5\sin x + 3\cos x}{\sin x + \cos x}\right)dx$.

OR

Evaluate : $\int \frac{dx}{\sin^4 x \cos^2 x}$

Q.20 Obtain the differential equation of all circles of radius *r*.

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

If $f: R \to R,\ g: R \to R$ be defined by $f(x) = \frac{3x-7}{8}, g(x) = \frac{8x+7}{3}$ then, find fog (7). Then find $\int \frac{dx}{fog(7)}$.

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Q.22 If $y = \log_{\sqrt{e}} \sin x$, find $\frac{dy}{dx}$.

Q.23 If the curves $y = ae^x$ and $y = be^{-x}$ cut orthogonally, find the relation between a and b.

Q.24 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.

OR

If $\vec{P} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{q} = \hat{i} - 2\hat{j} + \hat{k}$, find a vector of magnitude $5\sqrt{3}$ units perpendicular to the vector $\vec{q}$ and coplanar with vectors $\vec{p}$ and $\vec{q}$.

Q.25 Find the equation of the line passing through the point (-4, 3, 1), parallel to the plane $x + 2y - z = 0$ and intersecting the line $\frac{x+1}{3} = \frac{y-3}{-2} = \frac{z-2}{1}$.

Q.26 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) .

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 Find all the points of discontinuity of the function f (x) = $[x^2]$ on [1 , 2)where [ ]denotes the greatest integer function.

OR

If $x\sqrt{(1+y)} + y\sqrt{(1+x)} = 0$ then $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$.

Q.29 Find the particular solution of the following differential equation.

	$\cos y\,dx+\left(1+2e^{-x}\right)\sin y\,dy=0; y(0)=\frac{\pi}{4}$.
Q.30	Evaluate : $\int_0^1 \sin^{-1}\left(x\sqrt{1-x}-\sqrt{x}\sqrt{1-x^2}\right)dx$. **OR** Evaluate : $\int \frac{x+\sin x}{1+\cos x}dx$
Q.31	A coin is tossed until a head appears or the tail appears 4 times in succession .Find the probability distribution of the number of tosses . Find the mean also . **OR** Bag I contains 5 red and 4 white balls and bag II contains 3 red and 3 white balls. Two balls are transferred from bag I to bag II and then one ball is drawn from bag II. The balls so drawn are both found to be red. Find the probability that the transferred ball is 1 red and 1 white.
Q.32	A company produces two different products. One of them needs 1/4 of an hour of assembly work per unit, 1/8 of an hour in quality control work and Rs1.2 in raw materials. The other product requires 1/3 of an hour of assembly work per unit, 1/3 of an hour in quality control work and Rs 0.9 in raw materials. Given the current availability of staff in the company, each day there is at most a total of 90 hours available for assembly and 80 hours for quality control. The first product described has a market value (sale price) of Rs 9 per unit and the second product described has a market value (sale price) of Rs 8 per unit. In addition, the maximum amount of daily sales for the first product is estimated to be 200 units, without there being a maximum limit of daily sales for the second product. Formulate and solve graphically the LPP and find the maximum profit.

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PART – D **(Question 33 to 36 carry 6 mark each.)**

Q.33	Using properties of determinants, prove that: $\begin{vmatrix} a & b-c & c+b \\ a+c & b & c-a \\ a-b & b+a & c \end{vmatrix} = (a+b+c)(a^2+b^2+c^2)$. **OR** Using elementary row transformations, find the inverse of the matrix A = $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ and use it to solve the following system of linear equations : x +2 y – 2z = -1 ; - x + 3y = 5 ; - 2y + z = - 1 .
Q.34	Draw the rough sketch of the region enclosed between the circles $x^2+y^2=4$ and $(x-2)^2+y^2=1$. Using integration, find the area of the enclosed region .
Q.35	A point on the hypotenuse of a right triangle is at a distance 'a' and 'b' from the sides of the triangle. Show that the minimum length of the hypotenuse is $[a^{2/3}+b^{2/3}]^{3/2}$. OR Find the minimum value of (ax + by), where $xy = c^2$.
Q.36	Find the equation of the line drawn through point (1, 0, 2) to meet at right angles the line $\frac{x+1}{3}=\frac{y-2}{-2}=\frac{z+1}{-1}$.
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	शिक्षा की जड़ कडवी है, पर उसके फल मीठे हैं.

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