SHRI KRISHNA ACADEMY

NEET,JEE & BOARD EXAM(10^{th},+1,+2) COACHING CENTRE
SBM SCHOOL CAMPUS, TRICHY MAIN ROAD,NAMAKKAL
CELL: 99655 31727 , 94432 31727

FIRST MID TERM EXAMINATION 2019

STD: XII

SUBJECT: MATHEMATICS **ANSWER KEY** **MARKS : 50**

Q.No	PART-A	MARKS
1.	(d) consistent and has a unique solution	1
2.	(b) 4	1
3.	(d) 1	1
4.	(d) $x=\frac{\Delta_1}{\Delta}, y=\frac{\Delta_2}{\Delta}, z=\frac{\Delta_3}{\Delta}, \Delta \neq 0$	1
5.	(a) $\frac{1}{2}\lvert z\rvert^2$	1
6.	(d) $\frac{\pi}{2}$	1
7.	(a) 1	1
8.	(b) -1	1
9.	(c) 4 or1	1
10.	(a) $\frac{-q}{r}$	1
	PART-B	
11.	Let $A=\begin{bmatrix}1&2&3\\2&1&4\\3&0&5\end{bmatrix}$ $\sim\begin{bmatrix}1&2&3\\0&-3&-2\\0&0&0\end{bmatrix}$ $R_2\to R_2-2R_1, R_3\to R_3-3R_1$ $R_3\to R_3-2R_2$ $\rho(A)=2$	1 1
12.	$\Delta=\begin{vmatrix}5&-2\\1&3\end{vmatrix}=17 : \Delta_1=\begin{vmatrix}-6&-2\\7&3\end{vmatrix}=-4; \Delta_2=\begin{vmatrix}5&-6\\1&7\end{vmatrix}=41$ $x=\frac{-4}{17}; y=\frac{41}{17}$	1 1
13.	$i^{1948}-i^{-1869}=1-\frac{1}{i}$ $=i+1$	1 1
14.	Let $1-i=r(cis\theta), r=\sqrt{2}, \theta=\frac{-3\pi}{4}$ $=\sqrt{2}\left[cis\left(\frac{-3\pi}{4}\right)\right]$	1

	$=\sqrt{2}\left[cis\left(2k\pi-\frac{3\pi}{4}\right)\right], k\in Z$	1
15.	$\alpha+\beta+\gamma=0; \alpha\beta+\beta\gamma+\gamma\alpha=-3: \alpha\beta\gamma=-2$ The cubic equation is $x^3-(\alpha+\beta+\gamma)x^2+(\alpha\beta+\beta\gamma+\gamma\alpha)x-\alpha\beta\gamma=0$ $x^3-3x+2=0$	1 1
16.	Let $Z=(1)^{1/4}=(cis0)^{1/4}=cis\left(\frac{2k\pi}{4}\right), k=0,1,2,3$ The roots are 1,-1,i,-i	1 1
	PART-C	
17.	$\lvert adjA\rvert=9$ $A^{-1}=\pm\frac{1}{\sqrt{\lvert adjA\rvert}}adjA=\pm\frac{1}{3}\begin{bmatrix}-1&2&2\\1&1&2\\2&2&1\end{bmatrix}$	1 2
18.	$[A\mid I_2]=\left[\begin{array}{cc\|cc}0&5&1&0\\-1&6&0&1\end{array}\right]$ $=\left[\begin{array}{cc\|cc}1&0&(6/5)&-1\\0&1&(1/5)&0\end{array}\right]$ $R_1\leftrightarrow R_2; R_2\to\frac{1}{5}R_2; R_1\to R_1+6R_2$ $R_3\to R_3-2R_2$ $=[I_2\mid A]$ $A^{-1}=\begin{bmatrix}6/5&-1\\1/5&0\end{bmatrix}(or)\frac{1}{5}\begin{bmatrix}6&-5\\1&0\end{bmatrix}$	2 1
19.	*Distance between origin to* $i=\lvert i\rvert=1$ *Distance between origin to* $-2+i=\lvert -2+i\rvert=\sqrt{5}$ *Distance between origin to* $i=\lvert 3\rvert=3$ The farthest point from the origin is 3	2 1
20.	$(x_1+iy_1)(x_2+iy_2)(x_3+iy_3)\ldots\ldots\ldots(x_n+iy_n)=a+ib$ Taking modulus on both sides $\lvert x_1+iy_1\rvert\lvert x_2+iy_2\rvert\lvert x_3+iy_3\rvert\ldots\ldots\ldots\lvert x_n+iy_n\rvert=\lvert a+ib\rvert$ $\sqrt{x_1^2+y_1^2}\sqrt{x_2^2+y_2^2}\sqrt{x_3^2+y_3^2}\ldots\ldots\ldots\sqrt{x_n^2+y_n^2}=\sqrt{a^2+b^2}$ squaring on both sides $(x_1^2+y_1^2)(x_2^2+y_2^2)(x_3^2+y_3^2)\ldots\ldots\ldots(x_n^2+y_n^2)=(a^2+b^2)$	1 1 1
21.	$\alpha+\beta+\gamma=\frac{16}{3}; \alpha\beta+\beta\gamma+\gamma\alpha=\frac{23}{3}: \alpha\beta\gamma=2$ Let $\alpha\beta=1\Rightarrow\beta=\frac{1}{\alpha}$ Then $\gamma=2$ The other roots are $3,\frac{1}{3}$ $\alpha=3; \beta=\frac{1}{3}; \gamma=2$	1 1 1

22.	Since $x-\sqrt{\frac{\sqrt{2}}{\sqrt{3}}}$ is a factor, Hence $x+\sqrt{\frac{\sqrt{2}}{\sqrt{3}}}$ is also a factor	1
	Their product is $x^2-\frac{\sqrt{2}}{\sqrt{3}}$	
	$\Rightarrow x^2+\frac{\sqrt{2}}{\sqrt{3}}, x^2-\frac{\sqrt{2}}{\sqrt{3}}$ are two roots	1
	$3x^4-2=0$ is required polynomial equation	1

PART-D

23.	(a) The matrix can be written as AX=B is $\begin{pmatrix} 2 & 3 & -1 \\ 1 & 1 & 1 \\ 3 & -1 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix}=\begin{pmatrix} 9 \\ 9 \\ -1 \end{pmatrix}$	
	$\lvert A\rvert=16\neq 0$,	1
	$adjA=\begin{pmatrix} 0 & 4 & 4 \\ 4 & 1 & -3 \\ -4 & 11 & -1 \end{pmatrix}$	2
	The matrix can be written as X=A^{-1} B is $\begin{pmatrix} x \\ y \\ z \end{pmatrix}=\frac{1}{16}\begin{pmatrix} 0 & 4 & 4 \\ 4 & 1 & -3 \\ -4 & 11 & -1 \end{pmatrix}\begin{pmatrix} 9 \\ 9 \\ -1 \end{pmatrix}=\begin{pmatrix} 2 \\ 3 \\ 4 \end{pmatrix}$	2
	(b) The matrix can be written as AX=B is $\begin{pmatrix} 1 & 2 & 1 \\ 1 & 1 & \lambda \\ 1 & 3 & -5 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix}=\begin{pmatrix} 7 \\ \mu \\ 5 \end{pmatrix}$	
	$[A\mid B]=\begin{bmatrix} 1 & 2 & 1 & 7 \\ 1 & 1 & \lambda \mid & \mu \\ 1 & 3 & -5 & 5 \end{bmatrix}$	
	$=\begin{bmatrix} 1 & 2 & 1 & 7 \\ 0 & 1 & -6 \mid & -2 \\ 0 & 0 & \lambda-7 & \mu-9 \end{bmatrix}$ $R_2\leftrightarrow R_3; R_2\to R_2-R_1; R_3\to R_3-R_1$ $R_3\to R_3+R_2$	2
	(i) when $\lambda=7, \mu\neq 9 \Rightarrow \rho(A)=2, \rho(A\mid B)=3$ The system is inconsistent and no solution..	1
	(ii) when $\lambda\neq 7, \mu\in R \Rightarrow \rho(A)=3, \rho(A\mid B)=3$=no of unknowns The system is consistent and unique solution..	1
	(iii) when $\lambda=7, \mu=9 \Rightarrow \rho(A)=2, \rho(A\mid B)=2$ <No of unknowns The system is consistent and infinite many solution..	1
24.	(a) $\lvert A\rvert=-1$	1
	$adjA=\frac{1}{9}\begin{pmatrix} 8 & -4 & -1 \\ -1 & -4 & 8 \\ -4 & -7 & -4 \end{pmatrix}$	1
		1

	$A^{-1}=\frac{1}{9}\begin{pmatrix}-8&4&1\\1&4&-8\\4&7&4\end{pmatrix}$ $A^{T}=\frac{1}{9}\begin{pmatrix}-8&4&1\\1&4&-8\\4&7&4\end{pmatrix}$ $A^{-1}=A^{T}$	1 1
	(b) The matrix can be written as AX=B is $\begin{pmatrix}1&-1&2\\2&1&4\\4&-1&1\end{pmatrix}\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}2\\7\\4\end{pmatrix}$ $[A\mid B]=\begin{bmatrix}2&-1&2&2\\2&1&4&7\\4&-1&1&4\end{bmatrix}$ $\sim\begin{bmatrix}1&-1&2&2\\0&3&0&3\\0&0&-7&-4\end{bmatrix}$ $R_2\to R_2-2R_1;R_3\to R_3-4R_1$ $R_3\to R_3-R_2$ $\Rightarrow\rho(A)=\rho(A\mid B)=3$=no of unknowns The system is consistent and unique solution. $\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}1\\1\\1\end{pmatrix}$	2 1 2
25	(a) Let $z_1=1;z_2=\frac{-1}{2}+i\frac{\sqrt{3}}{2};z_3=\frac{-1}{2}-i\frac{\sqrt{3}}{2}$ $\lvert z_1-z_2\rvert=\sqrt{3};\lvert z_2-z_3\rvert=\sqrt{3};\lvert z_3-z_1\rvert=\sqrt{3}$ Since the sides are equal The given points form an equilateral triangle.	3 2
	(b) Let z= x+iy $\frac{2z+1}{iz+1}=\frac{(2x+1)+i2y}{(1-y)-ix}$ $\text{Im}\left(\frac{2z+1}{iz+1}\right)=\frac{2y(1-y)-x(2x+1)}{(1-y)^2+x^2}$ $\text{Im}\left(\frac{2z+1}{iz+1}\right)=0\Rightarrow 2x^2+2y^2+x-2y=0$ Which is the locus of Z	1 1 2 1
26.	(a) $\alpha+\beta+\gamma=\frac{-b}{a};\alpha\beta+\beta\gamma+\gamma\alpha=\frac{c}{a}:\alpha\beta\gamma=\frac{-d}{a}$ $\alpha^2+\beta^2+\gamma^2=(\alpha+\beta+\gamma)^2-2(\alpha\beta+\beta\gamma+\gamma\alpha)=\frac{b^2-2ac}{a}$ $\sum\frac{\alpha}{\beta\gamma}=\frac{\alpha^2+\beta^2+\gamma^2}{\alpha\beta\gamma}=\frac{2ac-b^2}{ad}$	2 1 2
	(b) Question is wrong,	

NAMAKKAL DISTRICT

N

FIRST MID TERM TEST - JULY- 2019

STANDARD - XII

MATHEMATICS

Time : 1-30 hours **Marks - 50**

Part - A

I. Choose the correct or more suitable answer: **10 × 1 = 10**

1. If there are n unknowns in the system of equations $P(A) = P(A/B) = n$, then the system $A \times = B$ has
   (a) consistent (b) inconsistent
   (c) consistent and infinitely many solutions (d) consistent and has a unique solution

2. If $|\text{adj}(\text{adj } A)| = |A|^9$, then the order of a square matrix A is
   (a) 3 (b) 4 (c) 2 (d) 5

3. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and $A(\text{adj } A) = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then K =
   (a) 0 (b) $\sin\theta$ (c) $\cos\theta$ (d) 1

4. Which of the following is Crammer's Rule
   (a) $x = \frac{\Delta}{\Delta}, y = \frac{\Delta}{\Delta_2}, z = \frac{\Delta}{\Delta_3}, \Delta \neq 0$ (b) $x = \frac{\Delta_1}{\Delta}, y = \frac{\Delta_2}{\Delta}, z = \frac{\Delta_3}{\Delta}, \Delta = 0$
   (c) $x = \frac{\Delta}{\Delta_1}, y = \frac{\Delta}{\Delta_2}, z = \frac{\Delta}{\Delta_3}, \Delta = 0$ (d) $x = \frac{\Delta_1}{\Delta}, y = \frac{\Delta_2}{\Delta}, z = \frac{\Delta_3}{\Delta}, \Delta \neq 0$

5. The area of the triangle formed by the complex numbers z, i z and z, + i z in the Argand's diagram is
   (a) $\frac{1}{2}|z|^2$ (b) $|z|^2$ (c) $\frac{3}{2}|z|^2$ (d) $2|z|^2$

6. The principal argument of the complex number $\frac{(1+i\sqrt{3})^2}{4i(1-i\sqrt{3})}$ is
   (a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{2}$

7. If $\omega = \text{Cis}\frac{2\pi}{3}$, then the number of district roots of $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$ is
   (a) 1 (b) 2 (c) 3 (d) 4

8. If α and β are the roots of the equation $x^2 + x + 1 = 0$, then the value of $\alpha^{2020} + \beta^{2020}$
   (a) −2 (b) −1 (c) 1 (d) 2

9. If the roots of equation $x^2 + 2(k+2)x + 9k = 0$ are equal then the value of K is
   (a) −4 or 1 (b) 4 or −1 (c) 4 or 1 (d) −4 or −1

10. If α, β and γ are the zeros of $x^3 + px^2 + qx + r$, then $\sum\frac{1}{\alpha}$ is
    (a) $\frac{-q}{r}$ (b) $\frac{-p}{r}$ (c) $\frac{q}{r}$ (d) $\frac{-q}{p}$

Part - B

II. Answer ANY FOUR questions. Question number 16 is compulsory: **4 × 2 = 8**

11. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$ by reducing it to a row - echelon form.

12. Solve the following linear equations by using Crammer's Rule $5x-2y+6=0, x+3y-7=0$.
13. Simplify: $i^{1948} \_\_ i^{-1869}$
14. Find the polar form of a complex number $-1-i$.
15. Find the cubth degree equation whose roots are 1, 1 and -2.
16. Find the Fourth roots of unity.

Part - C

III. Answer ANY FOUR questions, Question number 22 is compulsory: **4 × 3 = 12**

17. Find A^{-1} if $adj\ A = \begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$.
18. Find the inverse of the non - singular matrix $A = \begin{bmatrix} 0 & 5 \\ -1 & 6 \end{bmatrix}$ by Gauss - Jordan method.
19. Which one of the points i, $-2+i$ and 3 is farthest from the origin?
20. If $(x_1+iy_1)(x_2+iy_2)(x_3+iy_3)$ .... $(x_n+iy_n) = a+ib$, prove that $\left(x_1^2+y_1^2\right)\left(x_2^2+y_2^2\right)\left(x_3^2+y_3^2\right)$ .... $\left(x_n^2+y_n^2\right) = a^2+b^2$
21. Solve the equation $3x^3-16x^2+23x-6=0$ if the product of two roots is 1.
22. Form a polynomial equation with integer coefficients with $\sqrt{\frac{\sqrt{2}}{\sqrt{3}}}$ – as a root.

Part - D

IV. Answer ALL the questions. **4 × 5 = 20**

23. Solve the following system of linear equations by matrix inversion method.
$2x+3y-z=9, x+y+z=9, 3x-y-z=-1$.

(OR)

Investigate for what values of λ, and μ the system of linear equations $x+2y+z=7, x+y+\lambda z=\mu$, $x+3y-5z=5$ has (i) no solution (ii) a unique solution (iii) as infinite number of solutions.

24. If $A = \frac{1}{9}\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$, prove that $A^{-1} = A^T$.

(OR)

Test for consistency and if possible, solve the following system of equations by rank method.
$x-y+2z=2, 2x+y+4z=7, 4x-y+z=4$.

25. Show that the points $1, \frac{-1}{2}+i\frac{\sqrt{3}}{2}$ and $\frac{-1}{2}-\frac{i\sqrt{3}}{2}$ are the vertices of an equilateral triangle.

(OR)

If $z=x+iy$ is a complex number such that $\text{Im}\left[\frac{2z+1}{iz+1}\right]=0$, Show that the lows of Z is $2x^2+2y^2+x-2y=0$.

26. If α, β and γ are the roots of the polynomial equation $ax^3+bx^2+cx+d=0$ Find the value of $\sum\frac{\alpha}{\beta\gamma}$ in terms of the coefficients..

(OR)

Solve the equation $(2x-3)(6x-1)(3x-2)(x-12)-7=0$.

★★★★★