SHRI KRISHNA ACADEMY

NEET,JEE AND BOARD EXAM COACHING CENTRE
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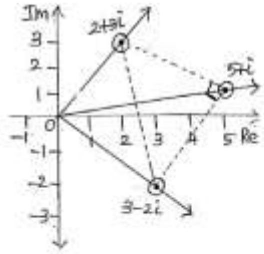
FIRST MID TERM TEST–2021(NAMAKKAL DISTRICT)

XII – MATHEMATICS **TENTATIVE ANSWER KEY**

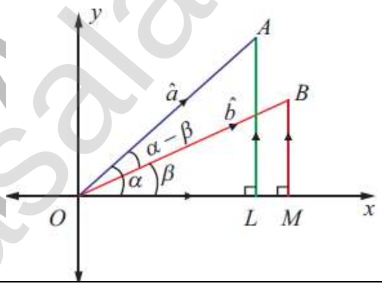
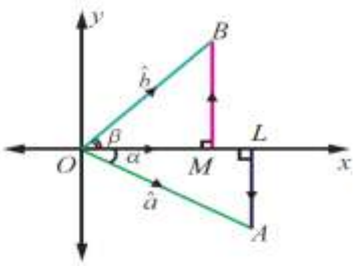
	PART – A	MARKS
1.	(b) 4	1
2.	(d)11	1
3.	(b) $\frac{-1}{i+2}$	1
4.	(a) z	1
5.	(a) 0	1
6.	(d) - 4	1
7.	Correct answer is n complex roots	1
8.	Correct answer is one negative and two imaginary roots	1
9.	(a) 81	1
10.	(c) (1,-2,-1) and (1,4,-2)	1
	PART – B	
11.	$\text{adj } A = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ $A^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$	1 1
12.	$adjA = \begin{bmatrix} 2 & -4 \\ -6 & -3 \end{bmatrix}$	2
13.	$Z+W=4+i$	2
14.	No positive and negative roots .but x=0 is one of the root No of real roots =1 No of imaginary root=8	1 1
15.	$\vec{a}.(\vec{b}\times\vec{c}) = \begin{vmatrix} -3 & -1 & 5 \\ 1 & -2 & 1 \\ 0 & 4 & -5 \end{vmatrix} = 1$	2
16.	Here $\vec{b} = 3\vec{i}+4\vec{j}+5\vec{k}, \vec{d} = 2\vec{i}+\vec{j}+\vec{k}$ $\cos\theta = \frac{15}{5\sqrt{2}\times\sqrt{6}} = \frac{\sqrt{3}}{2}$ $\theta = \cos^{-1}\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$	1 1

PART – C

17.	$A^{-1}=\frac{1}{4}\begin{bmatrix}2 & -2\\ -3 & 5\end{bmatrix}$ $X=A^{-1}B$ $\begin{bmatrix}x\\ y\end{bmatrix}=\frac{1}{4}\begin{bmatrix}2 & -2\\ -3 & 5\end{bmatrix}\begin{bmatrix}3\\ 5\end{bmatrix}$ $x=-1, y=4$	1 2
18.	$\lvert x+iy\rvert = \lvert x+iy-i\rvert$ $x^2+y^2 = x^2+y^2-2y+1$ $2y-1 = 0$	1 1 1
19.	If z=2+3i, −iz=3-2i and z-iz=5+i 	3
20.	$y^2-9y+20=0$ $2,-2,\sqrt{5},-\sqrt{5}$ as solutions of the given equation.	1 2
21.	*Given* $\vec{a},\vec{b},\vec{c}$ are coplanar $\therefore[\vec{a},\vec{b},\vec{c}]=0$ $[\vec{a}+\vec{b},\vec{b}+\vec{c},\vec{c}+\vec{a}]=\begin{vmatrix}1 & 1 & 0\\ 0 & 1 & 1\\ 1 & 0 & 1\end{vmatrix}[\vec{a}\,\vec{b}\,\vec{c}]$ =0	1 1 1
22.	$\vec{a}.\vec{a}=14, \vec{a}.\vec{c}=4, \vec{b}.\vec{a}=8, \vec{b}.\vec{c}=-3$ $(\vec{a}\times\vec{b}).(\vec{a}\times\vec{c})=\begin{vmatrix}\vec{a}.\vec{a} & \vec{a}.\vec{a}\\ \vec{b}.\vec{a} & \vec{b}.\vec{c}\end{vmatrix}=-74$	1 2

PART – D

23.(a)	$\lvert A\rvert=\begin{vmatrix}8 & -6 & 2\\ -6 & 7 & 4\\ 2 & -4 & 3\end{vmatrix}=160$ $\quad adjA=\begin{bmatrix}37 & 10 & -38\\ 26 & 20 & -44\\ 10 & 20 & 20\end{bmatrix}$ $A(adjA)=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & 4\\ 2 & -4 & 3\end{bmatrix}\begin{bmatrix}37 & 10 & -38\\ 26 & 20 & -44\\ 10 & 20 & 20\end{bmatrix}=\begin{bmatrix}160 & 0 & 0\\ 0 & 160 & 0\\ 0 & 0 & 160\end{bmatrix}=\lvert A\rvert I_3$ $(adjA)A=\begin{bmatrix}37 & 10 & -38\\ 26 & 20 & -44\\ 10 & 20 & 20\end{bmatrix}\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & 4\\ 2 & -4 & 3\end{bmatrix}=\begin{bmatrix}160 & 0 & 0\\ 0 & 160 & 0\\ 0 & 0 & 160\end{bmatrix}=\lvert A\rvert I_3$ $A(adjA)=(adjA)A=\lvert A\rvert I_3$	2 1 1 1
23.(b)	Since $1+2i$ and $\sqrt{3}$ are roots,1-2i and-$\sqrt{3}$ also roots. $(x-1-2i)(x-1+2i)(x-\sqrt{3})(x+\sqrt{3})=0$	1 1

	$x^4-3x^2-2x^3+6x+5x^2-15=0$ The roots are:1+2i,1-2i, $\sqrt{3}$,-$\sqrt{3}$, $\frac{1\pm\sqrt{37}}{2}$	3
24.(a)	$\Delta=-22,\Delta_x=-44,\Delta_y=-66,\Delta_z=-88,$ $x=2,y=3,z=4$	3 2
24.(b)	Correct question is $3x^3-16x^2+23x-6=0$ Given: $\alpha\beta=\beta\gamma=\gamma\alpha=1$ $3\alpha^2-10\alpha+3=0$ The roots are:3,1/3,2	2 3
25.(a)	Z=x+iy $\operatorname{Im} z\left(\frac{2x+1+i2y}{1-y+ix}\right)=0$ $\frac{(1-y)(2y)-(2x+1)(x)}{(1-y)+x^2}=0$ The locus of z is: $2x^2+2y^2+x-2y=0$	1 1 2 1
25.(b)	Diagram $\vec{a}=\cos\alpha\hat{i}+\sin\alpha\hat{j}$ $\vec{b}=\cos\beta\hat{i}+\sin\beta\hat{j}$ $\vec{a}.\vec{b}=\|\vec{a}\|\|\vec{b}\|\cos(\alpha-\beta)=\cos(\alpha-\beta)\quad\rightarrow(1)$ $\vec{a}.\vec{b}=\cos\alpha\cos\beta+\sin\alpha\sin\beta\quad\rightarrow(2)$ $(1)\&(2)\Rightarrow\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$ 	1 1 1 1 1
26.(a)	Diagram $\hat{a}=\cos\alpha\hat{i}-\sin\alpha\hat{j}$ $\hat{b}=\cos\beta\hat{i}+\sin\beta\hat{j}$ By definition $\vec{a}\times\vec{b}=\|\vec{a}\|\|\vec{b}\|\sin(\alpha+\beta)\vec{k}=\sin(\alpha+\beta)\vec{k}\quad\rightarrow(1)$ $\vec{a}\times\vec{b}=(\sin\alpha\cos\beta+\cos\alpha\sin\beta)\vec{k}\quad\rightarrow(2)$ $(1)\&(2)\Rightarrow\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ 	1 1 1 1 1
26.(b)	Non parametric form of vector eqn: $\vec{r}.(3\vec{i}+4\vec{j}-5\vec{k})-9=0$ Cartesian eqn:3x+4y-5z-9=0	2 3

FIRST MID TERM TEST - 2021

Standard - 12

NAMAKKAL-DISTRICT

Time : 1.30 Hrs **MATHEMATICS** Marks: 50

PART - A

i) **Answer for ALL the questions.** **10×1=10**

ii) **Choose the correct answer from the four given alternatives.**

1) If $|adj(adj\ A)| = |A|^9$, then the order of the square matrix A is

a) 3 b) 4 c) 2 d) 5

2) If $P = \begin{bmatrix} 1 & x & 0 \\ 1 & 3 & 0 \\ 2 & 4 & -2 \end{bmatrix}$ is the adjoint of 3×3 matrix A and $|A| = 4$, then x is

a) 15 b) 12 c) 14 d) 11

3) The conjugate of a complex number is $\frac{1}{i-2}$. Then the complex number is

a) $\frac{1}{i+2}$ b) $\frac{-1}{i+2}$ c) $\frac{-1}{i-2}$ d) $\frac{1}{i-2}$

4) If $|z| = 1$, then the value of $\frac{1+z}{1+\bar{z}}$ is

a) z b) $\bar{z}$ c) $\frac{1}{z}$ d) 1

5) $i^n+i^{n+1}+i^{n+2}+i^{n+3}$ is

a) 0 b) 1 c) −1 d) i

6) A zero of x^3+64 is

a) 0 b) 4 c) 4i d) −4

7) A polynomial equation in x of degree n always has

a) n distinct roots b) n real roots

c) n imaginary roots d) at most one root

8) The polynomial x^3+2x+3 has

a) one negative and two real roots b) one positive and two imaginary roots

c) three real roots d) no solution

9) If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar, non-zero vectors such that $[\vec{a}, \vec{b}, \vec{c}] = 3$, then $\{[\vec{a}\times\vec{b}, \vec{b}\times\vec{c}, \vec{c}\times\vec{a}]\}^2$ is equal to

a) 81 b) 9 c) 27 d) 18

10) The vector equation $\vec{r} = (\hat{i} - 2\hat{j} - \hat{k}) + t(6\hat{i} - \hat{k})$ represents a straight line passing through the points

a) (0, 6, −1) and (1, 2, 1) b) (0, 6, −1) and (1, 4, 2)

c) (1, −2, −1) and (1, 4, −2) d) (1, −2, −1) and (0, −6, 1)

PART - B

i) **Answer for ANY 4 questions.** **4×2=8**

ii) **Question Number 16 is compulsory.**

11) If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is non-singular, find A^{-1}.

12) Find the adjoint of the following: $\begin{bmatrix} -3 & 4 \\ 6 & 2 \end{bmatrix}$

13) Evaluate the following if $z = 5-2i$ and $w = -1+3i$, $z+w$.

14) Find the exact number of real roots and imaginary of the equation $x^9+9x^7+7x^5+5x^3+3x$.

15) If $\vec{a} = -3\hat{i} - \hat{j} + 5\hat{k}$, $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$, $\vec{c} = 4\hat{i} - 5\hat{k}$ and find $\vec{a}.(\vec{b} \times \vec{c})$.

16) Find the angle between the following lines:

$$\frac{x+4}{3} = \frac{y-7}{4} = \frac{z+5}{5}, \ \vec{r} = 4\hat{k} + t(2\hat{i} + \hat{j} + \hat{k})$$

PART - C

i) Answer for ANY 4 questions. **4×3=12**

ii) Question Number 22 is compulsory.

17) Solve the following system of linear equations, using matrix inversion method: $5x+2y = 3$, $3x+2y = 5$.

18) Obtain the Cartesian form of the locus of z in $|z| = |z-i|$.

19) Given the complex number $z = 2+3i$, represent the complex numbers in Argand diagram z, $-iz$ and $z-iz$.

20) Solve the equation $x^4-9x^2+20 = 0$.

21) If the vectors $\vec{a}, \vec{b}, \vec{c}$ are coplanar, then prove that the vectors $\vec{a}+\vec{b}$, $\vec{b}+\vec{c}$, $\vec{c}+\vec{a}$ are also coplanar.

22) If $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} - 4\hat{k}$, $\vec{c} = \hat{i} + \hat{j} + \hat{k}$ then find the value of $(\vec{a} \times \vec{b}).(\vec{a} \times \vec{c})$.

PART - D

Answer for ALL: **4×5=20**

23) a) If $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & 4 \\ 2 & -4 & 3 \end{bmatrix}$, verify that $A(\text{adj } A) = (\text{adj } A)A = |A|I_3$. **(OR)**

b) Find all zeros of the polynomial $x^6-3x^5-5x^4+22x^3-39x^2-39x+135$, if it is known that $1+2i$ and $\sqrt{3}$ are two of its zeros.

24) a) Solve the following systems of linear equations by Cramer's rule: $3x+3y-z = 11$, $2x-y+2z = 9$, $4x+3y+2z = 25$ **(OR)**

b) Solve the equation $3x^2-16x^2+23x-6 = 0$ if the product of two roots is 1.

25) a) If $z=x+iy$ is a complex number such that $\text{Im}\left(\frac{2z+1}{iz+1}\right) = 0$ show that the locus of z is $2x^2+2y^2+x-2y = 0$. **(OR)**

b) Using vector method, prove that $\cos(\alpha-\beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$.

26) a) Prove by vector method that $\sin(\alpha+\beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$. **(OR)**

b) Find the non-parametric form of vector equation and Cartesian equations of the plane passing through the points (2, 2, 1), (9, 3, 6) and perpendicular to the plane $2x+6y+6z = 9$.

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