Step Academy official

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STUDENT NAME	
PAPER CODE	60334
TIME ALLOWED	180
Paper Date	27-02-2026

CLASS	New 1st Year (FSC/ICS)
SUBJECT	Mathematics
TOTAL MARKS	100
Paper Type	

Q1. **Choose the correct answer.** **20X1=20**

1. Complex cube of -1 are:

(A) ω, ω^2 **(B)** $1, \omega, \omega^2$ **(C)** $-1, -\omega, -\omega^2$ **(D)** $-\omega, -\omega^2$

2. If ω is complex cube root of unity then ω=.....:

(A) 0 **(B)** 1 **(C)** ω^2 **(D)** $\frac{1}{\omega^2}$

3. If f: $A \to B$ is a function such that rang $f \subset B$, then f is called a/an ..... function:

(A) Onto **(B)** Injective **(C)** Bijective **(D)** Into

4. One root of equation x^2-3x+a=0 is 2, then a is:

(A) -2 **(B)** 2 **(C)** 3 **(D)** -3

5. An equation involving radical expression of the variable is called .....:

(A) Radical equation **(B)** Algebraic equation **(C)** Exponential equation **(D)** None of these

6. Graph of quadratic equation will be:

(A) Straight line **(B)** Curve **(C)** Set of line **(D)** None

7. If A is non-singular square matrix, then AA^{-1} equals .....:

(A) A **(B)** A^{-1} **(C)** 0 **(D)** 1

8. A realtion in which the equality is true for all finite values of unknowns is called an .....:

(A) Identity **(B)** Improper fraction **(C)** Proper fraction **(D)** Equation

9. $\frac{P(x)}{x^2+1}$ will be proper fraction if degree of P(x) equals:

(A) 1 **(B)** 2 **(C)** 3 **(D)** 0

10. If the nth term of an A.P is 1/2(3-n), then first three terms are:

(A) 3,2,1 **(B)** 1,2,3 **(C)** 1,2,1 **(D)** 1,1/2,0

11. If $a_n=(-1)^{n+1}$ then 26th term is:

(A) 1 **(B)** -1 **(C)** 26 **(D)** 24

12. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P then the common diffrence is .....:

(A) $\frac{2ac}{a-c}$ **(B)** $\frac{2ac}{a+c}$ **(C)** $\frac{a-c}{2ac}$ **(D)** $\frac{a+c}{2ac}$

13. If a_{n-3}=2n-5, then 7th term is:

(A) 9 **(B)** 15 **(C)** 11 **(D)** 13

14. The nth term of an A.P is 1/2(3n) the first three terms are .....:

(A) 3,2,1 **(B)** 1,2,3 **(C)** $\frac{3}{2},3,\frac{9}{2}$ **(D)** $\frac{3}{2},9,\frac{9}{2}$

15. The common ratio a G.P. cannot be .....:

(A) 3 **(B)** 1 **(C)** 2 **(D)** 0

16. No term of geometric sequence can be:

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3

17. For an infinite geometric series for which (r)<1, Sn=? where N=infinite:

(A) $\frac{a_1(1+r)}{1-r}$ **(B)** $\frac{a_1}{1-r}$ **(C)** $\frac{a_1}{2r}$ **(D)** $\frac{a_1}{2-r}$

18. If $y=\frac{2}{3}x+\frac{4}{9}x^2+\frac{8}{27}x^3+....$ then interval of convergent is .....:

(A) $0<x<-\frac{3}{2}$ **(B)** $-\frac{3}{2}<x<0$ **(C)** $\frac{1}{2}<x<-\frac{1}{2}$ **(D)** $0<x<\frac{3}{2}$

19. ${}^nC_r$ is valid only if:

(A) n≤r **(B)** r≤n **(C)** r>n **(D)** r

20. In how many ways a cricket team of 11 players out 15 can be selected if the captain must include in each ways:

(A) 15! **(B)** ${}^{14}C_{10}$ **(C)** ${}^{15}C_{11}$ **(D)** 11!

Q2. write the answers of following questions. Any 8 **8X2=16**

1 . Solve the following complex quadratic equation by completing square method: z^2-6z+30=0

2 . Evaluate: $\left(\frac{-1+\sqrt{-3}}{2}\right)^7+\left(\frac{-1-\sqrt{-3}}{2}\right)^7$

3 . Show that: $(1-\omega+\omega^2)(1-\omega^2+\omega^4)(1-\omega^4+\omega^8)(1-\omega^8+\omega^{16})...\ to\ 2n\ factors=2^{2n}$

4 . Plot the following points: (-3,120)

5 . Plot the following points: $\left(-\frac{9}{2},-\frac{19\pi}{12}\right)$

6 . Find $\frac{f(a+h)-f(a)}{h}$ and simplify where: $f(x)=4x+7$

7 . Given f(x)=x^3-$2x^2$+4x-1 find: f(1)

8 . Graph the following function: $y=-\frac{1}{2}\sqrt{x}$

9 .

The value of a stock follows the exponential growth model $P(t)=P_0e^{rt}$. Where P_o is the initial stock price, r is the growth rate per year and t is the time in years. Suppose a stock is currently valued at Rs,. 5,000 and it is expected to grow at a rate of 5% per year. (i) Find the value of the stock after 10 years. (ii) After many years will the stock double in value?

10 . Find the real values of x and y in the following: $\frac{x}{2+i}+\frac{y}{3-i}=4+5i$

11 . If z_1 and z_2 are two complex numbers, show that: $Arg(z_1z_2)=Arg\ z_1 + Arg\ z_2$

12 . Express the complex number $1+i\sqrt{3}$ in polar form.

Q4. write the answers of following questions. Any 8 **8X2=16**

1 . Find the maximum and minimum point by sketching the following quadratic function. Also find their domain and range: $f(x)=-x^2-4x+4$

2 . Solve the following absolute value quadratic equation and inequalities: $|x^2-4|<5$

3 . Solve the following absolute value quadratic equation and inequalities: $|x^2-5x+6|\le x+2$

4 . If $A=[a_{ij}]_{3\times 4}$, then show that, $I_3A=A$

5 . If A and B are square matrices of the same order, then explain why in general; $(A+B)^2\neq A^2+2AB+B^2$

6 . Without expansion show that: $\begin{vmatrix} -a & 0 & b \\ 0 & a & -c \\ c & -b & 0 \end{vmatrix}=0$

7 . If A is a square matrix of order 3, then show that $|KA|=K^3|A|$.

8 . Find the rank of the matrix $\begin{bmatrix} 1 & -1 & 2 & -3 \\ 2 & 0 & 7 & -7 \\ 3 & 1 & 12 & -11 \end{bmatrix}$.

9 . A triangle has A(2,3), B(-1,4) and C(3,-2). Find the vertices of the reflected triangle over the x-axis by using transformation matrix.

10 . Reduce $\begin{bmatrix} 2 & 3 & -1 & 9 \\ 1 & -1 & 2 & -3 \\ 3 & 1 & 3 & 2 \end{bmatrix}$ to (row) echelon and reduce (row) echelon form.

11 . Using properties of determinants, show that: $\begin{vmatrix} a^2+b^2 & c^2 & c^2 \\ a^2 & b^2+c^2 & a^2 \\ b^2 & b^2 & c^2+a^2 \end{vmatrix}=4a^2b^2c^2$

12 . If A and B are two matrices such that AB = B and BA = A, show that $A^2+B^2=A+B$.

Q5. write the answers of following questions. Any 9 **9X2=18**

1 . Sum the series: $\frac{4}{\sqrt{5}}+\sqrt{5}+\frac{6}{\sqrt{5}}+a_n$

2 . Find S_n for the following arithmetic series: $a_1=4$, $n=25$, $a_n=100$

3 . If $\frac{1}{a+b},\frac{1}{c+a},\frac{1}{b+c}$ are in A.P then show that a^2,b^2,c^2 are in A.P

4 . Find the first three terms of an arithmetic series in which $a_1=9$, $a_n=105$ and $S_n=741$.

5 . If a,b,c,d are in G.P., Prove that: a-b,b-c,c-d are in G.P.

6 . Find the eight term of a geometric sequence for which a_1=-3 and r=-2.

7 . Find the n^{th} term of the G.P., 3,12,48, ...

8 . Sum the following series upto n terms: 1 x 2 + 2 x 5 + 3 x 8 + ...

9 . Evaluate the following: $^{50}C_{50}$

10 . Find the number of possible arrangments of vowel letters from the English alphabet?

11 . Resolve the following into partial fraction: $\frac{2}{x^2-1}$

12 . Find the next four terms of the following sequence: 12,16,20, ...

13 . Find a_{n+1} and a_n if a_n=4+3n.

Q. write the answers of following questions. Any 6 **3X10=30**

1a . If ω is a cube root of unity, prove that $\frac{a\omega^{12}+b\omega^{17}+c\omega^{19}}{a\omega^{14}+b\omega^{22}+c\omega^{30}}=\omega$

b . If $z_1=9\left(\cos\frac{5\pi}{4}+i\sin\frac{5\pi}{4}\right) and\ z_2 5\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right)$ then find: $\frac{z_1}{z_2}$

2a . Find $\frac{f(a+h)-f(a)}{h}$ and simplify where: $f(x)=\sin x$

b . Find the point (s) of intersection of the following function graphically: f(x)=-3x-4, $g(x)=\frac{1}{2}x+3$

3a . Find the maximum and minimum value of the following quadratic function by completing squares: $f(x)=-2x^2-x+21$

b . Solve the following: $3x^2+15x-2\sqrt{x^2+5x+1}=2$

4a . Using properties of determinants, show that: $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}=(a+b+c)^3$

b . Solve the following systems of linear equation by Cramer's rule:

$$\left.\begin{aligned} x_1+2x_2-3x_3&=0 \\ 4x_1-x_2+x_3&=5 \\ -2x_1+3x_2+2x_3&=3 \end{aligned}\right\}$$

5a . Resolve $\frac{1}{(x+1)^2(x^2-1)}$ into partial fraction.

b . Prove that: $\frac{(2n+1)!}{n!}=[1.3.5..(2n-1)(2n+1)]2^n$