



## Standard 12 MATHEMATICS

Time: 1.30 Hrs.

Marks: 50

$10 \times 1 = 10$

I. Choose the correct answer of the following:

- 1) If  $A = \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$  then  $A \approx$ 
  - a)  $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$
  - b)  $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$
  - c)  $\begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$
  - d)  $\begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$
- 2) If  $A^T A^{-1}$  is symmetric, then  $A^2 =$ 
  - a)  $A^{-1}$
  - b)  $(A^T)^2$
  - c)  $A^T$
  - d)  $(A^{-1})^2$
- 3) If  $\rho(A) = \rho[AB]$ , then the system of linear equation is consistent then there is \_\_\_\_\_ solution
  - a) unique
  - b) two
  - c) no
  - d) infinitely many
- 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) The principal argument of  $(\sin 40^\circ + i \cos 40^\circ)^5$  is
  - a)  $-110^\circ$
  - b)  $-70^\circ$
  - c)  $70^\circ$
  - d)  $110^\circ$
- 6) The value of  $i^{1729} = \dots\dots\dots$ 
  - a)  $i$
  - b)  $-i$
  - c) 1
  - d)  $-1$
- 7) The value of  $\left(\frac{1+i\sqrt{3}}{1-i\sqrt{3}}\right)^{10}$  is
  - a)  $C$  is  $\frac{2\pi}{3}$
  - b)  $C$  is  $\frac{4\pi}{3}$
  - c)  $-C$  is  $\frac{2\pi}{3}$
  - d)  $-C$  is  $\frac{4\pi}{3}$
- 8) Zero of  $x^3+64 = 0$  is
  - a) 0
  - b) 4
  - c)  $4i$
  - d)  $-4$
- 9) The number of real numbers in  $[0, 2\pi]$  satisfying  $\sin^4 x - 2 \sin^2 x + 1$  is
  - a) 2
  - b) 4
  - c) 1
  - d)  $\infty$
- 10) If  $\alpha, \beta$  and  $\gamma$  are zero 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)  $-\frac{q}{p}$

II. Answer any FOUR questions:

$4 \times 2 = 8$

11) If  $\text{adj } A = \begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$  find  $A^{-1}$ .

12) Solve Cramer's rule  $2x - y = 8$  ;  $3x + 2y = -2$

13) Find the square root of  $-5 - 12i$

14) If  $|Z| = |Z - i|$  obtain the Cartesian equation for the locus of  $Z = x + iy$

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- 15) Find a polynomial equation of minimum degree with rational coefficients having  $2 - \sqrt{3}$  as a root.
- 16) Construct cubic equation with roots 1, 2 and 3.

### III. Answer any FOUR questions:

4 × 3 = 12

17) Find the rank of the following  $\begin{bmatrix} 1 & 1 & 1 & 3 \\ 2 & -1 & 3 & 4 \\ 5 & -1 & 7 & 11 \end{bmatrix}$

18) If  $A = \begin{bmatrix} 8 & -4 \\ -5 & 3 \end{bmatrix}$  verify that  $A(\text{adj } A) = (\text{adj } A)A = |A|I$ .

19) State and prove Triangle inequality.

20) If  $|Z| = 3$  prove that  $7 \leq |Z+6-8i| \leq 13$

21) Solve:  $8x^3 - 2x^2 + 7x + 3$

22) Determine the number of positive and negative roots of the equation  $x^9 - 5x^8 - 14x^7 = 0$ .

### IV. Answer any FOUR questions:

4 × 5 = 20

23) If  $F(\alpha) = \begin{bmatrix} \cos \alpha & 0 & \sin \alpha \\ 0 & 1 & 0 \\ -\sin \alpha & 0 & \cos \alpha \end{bmatrix}$  show that  $[F(\alpha)]^{-1} = F[-\alpha]$

24) Investigate the values of  $\lambda$  and  $\mu$  the system of linear equations  $2x+3y+5z = 9$ ;  $7x+3y-5z = 8$ ;  $2x+3y+\lambda z = \mu$  have  
(i) no solution (ii) a unique solution (iii) an infinite number of solutions

25) i) Show that  $(2+i\sqrt{3})^{10} - (2-i\sqrt{3})^{10}$  is purely imaginary

ii) If  $|2z+2-4i| = 2$  is the equation of the circle, and find its centre and radius.

26) If  $z = x+iy$  and  $\arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{2}$  show that  $x^2+y^2 = 1$

27) Solve:  $x^4 + 3x^3 - 3x - 1 = 0$

28) Solve the equation  $3x^3 - 26x^2 + 52x - 24 = 0$  if its roots form a geometric progression.