Matrix theory

ai24btech11035 - V.Preethika

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0) If $z = x + iy$ and $\omega = (1 - iz)/(z - i)$, then $|\omega| = 1$ implies that,in the complex plane
(1983 - 1 Mark)
   (a) z lies on the imaginary axis
   (b) z lies on the real axis
   (c) z lies on unit circle
   (d) None of these
1) The points z_1, z_2, z_3, z_4 in the complex plane are the vertices of a parallelogram taken in order if and only if
(1983 - 1 Mark)
   (a) $z_1 + z_4 = z_2 + z_3$
   (b) $z_1 + z_3 = z_2 + z_4$
   (c) $z_1 + z_2 = z_3 + z_4$
   (d) None of these
2) If a,b,c and u,v,w are complex numbers representing the vertices of two triangles such that $c = (1 - r)a + rb$ and $w = (1 - r)u + rv$,where r is a complex number,then the two triangles
(1985 - 2 Marks)
   (a) have the same area
   (b) are similar
   (c) are congruent
   (d) none of these
3) If $\omega\,(\neq 1)$ is a cube root of unity and $(1 + \omega)^7 = A + B\omega$ then A and B are respectively
(1995S)
   (a) $0, 1$
   (b) $2, 1$
   (c) $1, 0$
   (d) $-1, 1$
4) Let $z and \omega$ be two non zero complex numbers such that $|z| = |\omega|$ and $Argz + Arg\omega = \pi$, then z equals
(1995S)
   (a) ω
   (b) $-\omega$
   (c) $\overline{\omega}$
   (d) $-\overline{\omega}$
5) let $z and \omega$ be two complex numbers such that $|z| \leq 1$, $|\omega| \leq 1$ and $|z + i\omega| = |z - i\overline{\omega}| = 2$ then z equals
(1995S)
   (a) $1 or i$
   (b) $i or -1$
   (c) $1 or -1$
   (d) $i or -1$
6) For positive numbers n_1, n_2 the value of the expression $(1 + i)^{n_1} + \left(1 + i^3\right)^{n_1} + \left(1 + i^5\right)^{n_2} + \left(1 + i^7\right)^{n_2}$, where $i = \sqrt{-1}$ is a real number if and only if
(1996 - 2 Marks)
   (a) $n_1 = n_2 + 1$
   (b) $n_1 = n_2 - 1$
   (c) $n_1 = n_2$
   (d) $n_1 > 0, n_2 > 0$
7) If $i = \sqrt{-1}$ then $4 + 5\left(\frac{-1}{2} + \frac{i\sqrt{3}}{2}\right)^3 34 + 3\left(\frac{-1}{2} + \frac{i\sqrt{3}}{2}\right)^{365}$ is a real number if and only if
(1999 - 2 Marks)
   (a) $1 - i\sqrt{3}$
   (b) $-1 + i\sqrt{3}$
   (c) $i\sqrt{3}$
   (d) $-i\sqrt{3}$
8) If $arg\,(z) < 0$,then $arg\,(-z) - arg\,(z) =$
(2000S)
   (a) π
   (b) $-\pi$
   (c) $\frac{-\pi}{2}$
   (d) $\frac{\pi}{2}$
9) If $z_1, z_2 and z_3$ are complex numbers such that $|z_1| = |z_2| = |z_3| = \left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right| = 1$, then $|z_1 + z_2 + z_3|$ is
(2000S)
   (a) equal to 1
   (b) less than 1
   (c) greater than 3
   (d) equal to 3
10) Let $z_1 and z_2$ be n^{th} roots of unity which subs-tend a right angle at the origin.Then n must be of the form

(2001S)

(a) $4k+1$
(b) $4k+2$
(c) $4k+3$
(d) $4k$

11) The complex numbers $z_1, z_2 and z_3$ satisfying $\frac{z_1-z_3}{z_2-z_3} = \frac{1-i\sqrt{3}}{2}$ are the vertices of a triangle which is

(2001S)

(a) of area zero
(b) right angled triangle
(c) equilateral
(d) obtuse-angled triangle

12) For all complex numbers z_1, z_2 satisfying $|z_1| = 12$ and $|z_2 - 3 - i| = 5$, the minimum value of $|z_1 - z_2|$

(2002S)

(a) 0
(b) 2
(c) 7
(d) 17

13) If $|z| = 1$ and $\omega = \frac{z-1}{z+1}$ $(where z \neq 1)$, then $\text{Re}(\omega)$ is

(2003S)

(a) 0
(b) $\frac{-1}{|z+1|^2}$
(c) $\left|\frac{z}{z+1}\right| . \frac{1}{|z+1|^2}$
(d) $\frac{\sqrt{2}}{|z+1|^2}$

14) If $\omega (\neq 1)$ be a cube root of unity and $\left(1+\omega^2\right)^n = \left(1+\omega^4\right)^n$, then the least positive value of n is

(2004S)

(a) 2
(b) 3
(c) 5
(d) 6