Number System

01. $Z = \cos\theta + i\sin\theta \quad \frac{1}{Z} = ?$

$$\bar{Z}^{-1} = \left(\frac{a}{a^2+b^2}, \frac{-b}{a^2+b^2}\right)$$

$$\bar{z}^{1} = \left(\frac{\cos\theta}{\cos^2\theta+\sin^2\theta}, \frac{-\sin\theta}{\sin^2\theta+\cos^2\theta}\right)$$

$$= (\cos\theta, -\sin\theta)$$

$$= \cos\theta - i\sin\theta$$ (C) Ans.

02. $x + yi + 6 + 2i = 0 + 0i$

$x + 6 = 0$ $\quad$ $yi + 2i = 0i$

$x = -6$ $\quad$ $\cancel{i}(y+2) = 0\cancel{i}$

$\boxed{y = -2}$

(B) Ans

03. $(\sqrt{3}, \sqrt{2})$

$$\bar{z}^{1} = \left(\frac{\sqrt{3}}{(\sqrt{3})^2+(\sqrt{2})^2}, \frac{-\sqrt{2}}{(\sqrt{3})^2+(\sqrt{2})^2}\right)$$

$$\bar{z}^{-1} = \left(\frac{\sqrt{3}}{5}, \frac{-\sqrt{2}}{5}\right)$$ (D)

04. $\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)^2$

$(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$

$\cos\frac{\pi}{\cancel{6}_3} \times \cancel{2} + i\sin\frac{\pi}{\cancel{6}_3} \times \cancel{2}$

$\frac{1}{2} + \frac{\sqrt{3}}{2} i$

(B) Ans.

05. $5x + 3yi + 7 = 12 + 9i$

$5x + 3yi = 12 - 7 + 9i$

$5x + 3yi = 5 + 9i$

$5x = 5, \quad 3y = 9$

$x = 1, \quad y = 3$

(D) Ans

06. $(5, -6) \times (8, 9)$ is Same

$(8, 9) \times (5, -6)$

(C) Ans

7. $(4, -3)$

$$\bar{z}^{-1} = \left(\frac{4}{4^2+(-3)^2}, \frac{-(-3)}{4^2+(-3)^2} \right)$$

$$= \left(\frac{4}{25}, \frac{3}{25} \right) \text{ (C) Ans}$$

8. $Re\left(\frac{2+3i}{3-5i}\right)$

$$\frac{2+3i}{3-5i} \times \frac{3+5i}{3+5i}$$

$$\frac{6+10i+9i+15i^2}{(3)^2-(5i)^2}$$

$$\frac{6+19i-15}{9-25(-1)} = \frac{-9+19i}{34}$$

$Re = -9/34$ (B) Ans

9. $$\left|\frac{1-7i}{4+i}\right| = \frac{|1-7i|}{|4+i|}$$

$$= \frac{\sqrt{(1)^2+(-7)^2}}{\sqrt{4^2+(1)^2}}$$

$$= \frac{\sqrt{50}}{\sqrt{17}} = \sqrt{\frac{50}{17}}$$

(B) Ans

10. $Arg(-\sqrt{3}-i)$

$$\tan\theta = \frac{y}{x}$$

$$= \frac{\mp 1}{\mp\sqrt{3}}$$

$$\theta = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$$

$$\theta = \frac{\pi}{6}$$

In 3rd quadrant.

$$Arg = -\pi+\theta$$

$$= -\pi+\frac{\pi}{6}$$

$$= -\frac{5\pi}{6}$$

(C) Ans

11. $1+i$

$$\theta = \tan^{-1}\left(\frac{1}{1}\right) = \frac{\pi}{4}$$

$$\cos\theta + i\sin\theta = \cos\frac{\pi}{4} + i\sin\frac{\pi}{4}$$

$$= cis\left(\frac{\pi}{4}\right)$$

$$r = \sqrt{(1)^2+(1)^2} = \sqrt{2}$$

Now, $r(\cos\theta + i\sin\theta) = \sqrt{2}\, cis\left(\frac{\pi}{4}\right)$ (D) Ans

12. (B) $\left(1-\frac{1}{i}\right)(1+i) = 1$

$$\left(\frac{i-1}{i}\right)(i+1) = 1$$

$$\frac{i^2-1^2}{i} = 1$$

$$\frac{-1-1}{i} \times \frac{-i}{-i} = 1$$

$$\frac{2i}{1} \neq 1$$

(B) Ans

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13. $\sqrt{-2} \times \sqrt{-8}$

$\sqrt{2}i \times \sqrt{8}i$

$\sqrt{2\times 8}\; i^2$

$\sqrt{16}\;(-1)$

-4 (C) An

(14) $\text{Img}[(2,3)(1,0)]$

$\text{Img}\;[(2+3i)(1+0i)]$

$\text{Img}\;[2+0+3i]$

$\text{Img}\;[2+3i]$

$\text{Img}=3$ (D) An

15. $\left[\cos\frac{2n\pi}{3} + i\sin\frac{2\pi n}{3}\right]^3$

Apply de-Moviers theorem

$\cos\frac{2n\pi}{\cancel{3}}\times\cancel{3} + i\sin\frac{2n\pi}{\cancel{3}}\times\cancel{3}$

1.

(B) An.

16. Conjugat of i is

$-i$

$(0, -1)$

(D) Ans

17. $(2+i)^2 = 4+4i+i^2$

$= 4+4i-1$

$= 3+4i$

Absolute value $= \sqrt{3^2+4^2}$

$= \sqrt{25}$

$= 5$ (C) An

18. $\text{Cis}(120°)\;\text{Cis}(-90°)$

$\text{cis}\,\theta_1 . \;\text{cis}\,\theta_2 = \text{cis}\,(\theta_1+\theta_2)$

$\text{cis}\;(120° - 90°)$

$= \text{Cis}\,30°$

(B) An

19. $(1+i)^5 (1-i)^5$

$\{(1+i)(1-i)\}^5$

$\{(1)^2 - (i)^2\}^5$

$\{1-(-1)\}^5$

$(2)^5$

32 D Ans.

20. $a+bi > c+di$

Inequality Apply on real no's so b & $d=0$.

B Ans