# EXERCISE LEVEL –I

EL– I

**Q.1** $\sqrt{-5}\sqrt{-\frac{16}{5}} =$

(a) 4 (b) –4 (c) 3 (d) 2

**Q.2** The values of x and y that satisfy the equation $(x + iy)(2 - 3i) = 4 + i$ in the real domain are

(a) $x = \frac{5}{13}, y = \frac{8}{13}$ (b) $x = \frac{8}{13}, y = \frac{5}{13}$ (c) $x = \frac{5}{13}, y = \frac{14}{13}$ (d) $x = -\frac{5}{13}, y = \frac{8}{13}$

**Q.3** If $(x + iy)(p + iq) = (x^2 + y^2)i$, then, where $x, y, p, q \in R$

(a) $p = x, q = y$ (b) $p = x^2, q = y^2$ (c) $x = q, y = p$ (d) $x = -q, y = p$

**Q.4** $|(1 + i)\frac{(2+i)}{(3+i)}|$ equals

(a) $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) 1 (d) –1

**Q.5** The expression $a + ib > c + id$ is meaningful only when

(a) $b = 0, c = 0$ (b) $b = 0, d = 0$ (c) $a = 0, c = 0$ (d) $a = 0, d = 0$

**Q.6** The polar form of complex number $\frac{i-1}{\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}}$ is given by

(a) $\sqrt{2}(\cos\frac{5\pi}{12} + i\sin\frac{5\pi}{12})$ (b) $\sqrt{2}(\cos\frac{5\pi}{12} - i\sin\frac{5\pi}{12})$

(c) $\sqrt{2}(-\cos\frac{5\pi}{12} + i\sin\frac{5\pi}{12})$ (d) $\sqrt{2}(-\cos\frac{5\pi}{12} - i\sin\frac{5\pi}{12})$

**Q.7** The real values of x and y that satisfy the equation $(x^4 + 2xi) - (3x^2 + yi) = (3 - 5i) + (1 + 2yi)$ are

(a) $x = \pm 2, y = 3, \frac{1}{3}$ (b) $x = 3, \frac{1}{3}, y = \pm 2$

(c) $x = \pm 1, y = 2$ (d) $x = \pm 2, y = 1$

**Q.8** If $a^2 + b^2 = 1$, then $\frac{1+b+ia}{1+b-ia}$ is equal to, (where $a, b \in R$ ).

(a) 1 (b) 2 (c) $b + ia$ (d) $a + ib$

**Q.9** If $z = 3 - 4i$ then $z^4 - 3z^3 + 3z^2 + 99z - 95$ is equal to

(a) 5 (b) 6 (c) –5 (d) 4

**Q.10** If $z = x - iy$ and $z^{1/3} = p + iq$, then $\frac{(\frac{x}{p}+\frac{y}{q})}{p^2+q^2}$ is equal to, where $x, y, p, q \in R$

(a) –2 (b) –1 (c) 2 (d) 1

**Q.11** The value of $\frac{(i^{11}+i^{12}+i^{13}+i^{14}+i^{15})}{(1+i)}$ is

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

**Q.12** If $(\frac{1+i}{1-i})^3 - (\frac{1-i}{1+i})^3 = a + ib$, then values of a and b respectively are

(a) 0 and 2 (b) 0 and -2 (c) 2 and 0 (d) 2 and 2

**Q.13** The conjugate of $\frac{(1+2i)^2}{3-i}$ is

(a) $\frac{-13}{10} + \frac{9}{10}i$ (b) $\frac{-13}{10} - \frac{9}{10}i$ (c) $\frac{13}{10} + \frac{9}{10}i$ (d) $\frac{13}{10} - \frac{9}{10}i$

**Q.14** If $z = 3 + i + 9i^2 - 6\hat{\beta}^3$, then $(\overline{z}^{-1})$ is

(a) $2 + i$ (b) $-\frac{3}{79} + \frac{4}{79}i$ (c) $1 - i$ (d) $-\frac{6}{85} + \frac{7}{85}i$

**Q.15** The modulus of $i^{25} + (i + 2)^3$ is

(a) $\sqrt{47}$ (b) $4\sqrt{15}$ (c) $\sqrt{35}$ (d) $2\sqrt{37}$

**Q.16** The polar form of $(i^{41})^3$ is
(a) $\cos\frac{\pi}{2}+i\sin\frac{\pi}{2}$ (b) $\cos\pi+i\sin\pi$
(c) $-\cos\pi-i\sin\pi$ (d) $\cos(\frac{-\pi}{2})+i\sin(\frac{-\pi}{2})$

**Q.17** The argument of $-2+2\sqrt{3}i$ is
(a) $-\frac{\pi}{3}$ (b) $\frac{\pi}{3}$ (c) $\frac{2\pi}{3}$ (d) $-\frac{2\pi}{3}$

**Q.18** The amplitude of $\frac{1}{i}$ is equal to
(a) 0 (b) $\frac{\pi}{2}$ (c) $-\frac{\pi}{2}$ (d) $\pi$

**Q.19** The additive inverse of $5+7i$ is
(a) $5-7i$ (b) $-5+7i$ (c) $5+7i$ (d) $-5-7i$

**Q.20** The complex number $\frac{1+2i}{1-i}$ lies in
(a) First quadrant (b) Sound quadrant (c) Third quadrant (d) Fourth quadrant

**Q.21** The value of $(1+i)^5\times(1-i)^5$ is
(a) -8 (b) 8i (c) 8 (d) 32

**Q.22** If, $z=3-2i$, then the value of $\mathrm{Re}(z)(\mathrm{lm}(z))^2$ is
(a) 6 (b) 12 (c) –6 (d) 12

**Q.23** If $z_1=1+i$ and, $z_2=-3+2i$, then $\mathrm{lm}(\frac{z_1z_2}{\bar{z}_1})$ is
(a) 2 (b) –3 (c) 3 (d) –2

**Q.24** The value of $(1+i)(1-i^2)(1+i^4)(1-i^5)$ is
(a) 2i (b) 8 (c) –8 (d) 8i

**Q.25** If, $z=4-9i$, then $z\bar{z}$ is
(a) –92 (b) –97 (c) 92 (d) 97

**Q.26** If $z=\frac{1+i}{\sqrt{2}}$, then the value of $z^{1929}$ is
(a) $1+i$ (b) $-1$ (c) $\frac{1+i}{2}$ (d) $\frac{1+i}{\sqrt{2}}$

**Q.27** If a multiplicative inverse of a complex number is $\frac{\sqrt{2}+5i}{17}$ then the complex number is.
(a) $\frac{\sqrt{2}-5i}{17}$ (b) $\frac{\sqrt{2}+5i}{29}$ (c) $\frac{17}{27}(\sqrt{2}-5i)$ (d) $\frac{17}{27}(\sqrt{2}+5i)$

**Q.28** $[i^{17}+\frac{1}{i^{315}}]^9$ is equal to
(a) 32i (b) –512 (c) 512 (d) 512i

**Q.29** $\frac{(1+i)^3}{2+i}$ is equal to
(a) $\frac{2}{5}-\frac{6}{5}i$ (b) 0 (c) $-\frac{1}{5}+\frac{6}{5}i$ (d) $-\frac{2}{5}+\frac{6}{5}i$

**Q.30** $(\frac{2}{1-i}+\frac{3}{1+i})(\frac{2+3i}{4+5i})$ is equal to
(a) $-\frac{117}{82}-\frac{13}{82}i$ (b) $-\frac{117}{82}+\frac{13}{82}i$ (c) $\frac{117}{82}-\frac{13i}{82}$ (d) $\frac{117}{82}+\frac{13i}{82}$

**Q.31** $\frac{3-\sqrt{-16}}{1-\sqrt{-25}}$ is equal to
(a) $\frac{-1}{24}$ (b) 0 (c) $\frac{23}{26}+\frac{11}{26}i$ (d) $23+5i$

**Q.32** If $z=a+ib$ is a complex number, then
(a) $\mathrm{Re}(z)=\bar{z}+\bar{z}$ (b) $\mathrm{Re}(z)=\frac{z\cdot\bar{z}}{2}$ (c) $\mathrm{Re}(z)=\frac{z-\bar{z}}{2}$ (d) $\mathrm{Re}(z)=\frac{z+\bar{z}}{2}$

**Q.33** The multiplicative inverse of $(3+\sqrt{5}i)^2$ is
(a) $\frac{1}{49}-\frac{3\sqrt{5}}{98}i$ (b) $\frac{1}{49}+\frac{3\sqrt{5}}{98}i$ (c) $4+6\sqrt{5}i$ (d) $4-6\sqrt{5}i$

**Q.34** $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ will be purely imaginary, then $\sin^2\theta$ is equal to
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) 1

**Q.35** If $x+iy=\frac{3}{2+\cos\theta+i\sin\theta}$, then the value of $x^2+y^2$ is
(a) $\frac{9}{4+5\sin\theta}$ (b) $\frac{9}{4+5\cos\theta}$ (c) $\frac{9}{5+4\cos\theta}$ (d) $\frac{9}{5+4\sin\theta}$

**Q.36** For any complex number z, the minimum value of$|z| + |z - 3i|$ is

(a) 2 (b) 3 (c) 9 (d) $\sqrt{3}$

**Q.37** If $z_1 = 3 + i$ and $z_2 = 2 - i$, then $\left|\frac{z_1+z_2-1}{z_1-z_2+i}\right|$ is

(a) $\sqrt{\frac{8}{5}}$ (b) $\frac{\sqrt{8}}{5}$ (c) $\frac{8}{5}$ (d) $\frac{8}{\sqrt{5}}$

**Q.38** If $z = \frac{1}{(1+i)(1-2i)}$, then $|z|$ is

(a) $\frac{2}{10}$ (b) $\frac{\sqrt{7}}{10}$ (c) $\frac{9}{\sqrt{10}}$ (d) $\frac{1}{\sqrt{10}}$

**Q.39** If $|z - 4 + 3i| \leq 2$, then the least and the greatest values of $|z|$ are

(a) 3,7 (b) 4,7 (c) 3,9 (d) 4,5

**Q.40** If $|z_1| = 2, |z_2| = 3, |z_3| = 4$ and, $|2z_1 + 3z_2 + 4z_3| = 4$, then the expression $|8z_2z_3 + 27z_3z_1 + 64z_1z_2|$ equal.

(a) 72 (b) 24 (c) 96 (d) 92

**Q.41** The maximum value of $|z|$ when z satisfies the condition $\left|z + \frac{2}{z}\right| = 2$ is

(a) $\sqrt{3} - 1$ (b) $\sqrt{3} + 1$ (c) $\sqrt{3}$ (d) $\sqrt{2} + \sqrt{3}$

**Q.42** The argument of the complex number $(1 + i)^4$ is

(a) 135° (b) 180° (c) 90° (d) 45°

**Q.43** If $z = \frac{-4+2\sqrt{3}i}{5+\sqrt{3}i}$, then the value of arg(z) is

(a) $\pi$ (b) $\frac{\pi}{3}$ (c) $\frac{2\pi}{3}$ (d) $\frac{\pi}{4}$

**Q.44** If $z = \cos\frac{\pi}{4} + i\sin\frac{\pi}{6}$, then

(a) $|z| = 1, \arg(z) = \frac{\pi}{4}$ (b) $|z| = 1, \arg(z) = \frac{\pi}{6}$

(c) $|z| = \frac{\sqrt{3}}{2}, \arg(z) = \frac{5\pi}{24}$ (d) $|z| = \frac{\sqrt{3}}{2}, \arg(z) = \tan^{-1}\frac{1}{\sqrt{2}}$

**Q.45** The sum of principal argument of complex number $1 + i, -1 + i\sqrt{3}, -\sqrt{3} - i, \sqrt{3} - i, i, -3i, 2, -1$is

(a) $\frac{11\pi}{12}$ (b) $\frac{13\pi}{12}$ (c) $\frac{12\pi}{13}$ (d) $\frac{\pi}{15}$

**Q.46** If $z_1, z_2$ and $z_3, z_4$ are two pairs of conjugate complex numbers, then $\arg(\frac{z_1}{z_3}) + \arg(\frac{z_2}{z_4})$ is

(a) 0 (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{4}$ (d) $\pi$

**Q.47** If $\arg z = \frac{\pi}{4}$, then

(a) $\mathrm{Re}(z^2) = 91\text{ m }(z^2)$ (b) $\mathrm{Im}(z^2) = 0$

(c) $\mathrm{Re}(z^2) = 0$ (d) $\mathrm{Re}(z) = 0$

**Q.48** The polar form of complex number $\sqrt{3} + i$ is

(a) $2(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})$ (b) $2(\cos\frac{\pi}{6} - i\sin\frac{\pi}{6})$

(c) $2(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6})$ (d) $2(-\cos\frac{\pi}{6} + i\sin\frac{\pi}{6})$

**Q.49** Let $A = \{\theta \in (-\frac{\pi}{2}, \pi): \frac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely imaginary $\}$ then the sum of element in A is.

(a) $\frac{5\pi}{6}$ (b) $\pi$ (c) $\frac{3\pi}{4}$ (d) $\frac{2\pi}{3}$

**Q.50** Let $z_1$ and $z_2$ be any two non – zero complex number such that $3|z_1| = 4|z_2|$. If $z = \frac{3z_1}{2z_2} + \frac{2z_2}{3z_1}$ then

(a) $\mathrm{Im}(z) = 0$ (b) $\frac{3}{2} \leq |z| \leq \frac{5}{2}$ (c) $|z| = \frac{1}{2}\sqrt{\frac{17}{2}}$ (d) $\mathrm{Re}(z) = 0$

# EXERCISE LEVEL –II

EL–II

**Q.1** Express the following as complex number

a. $\sqrt{-16}$ b. $-b + \sqrt{-4ac}, (a, c > 0)$,

**Q.2** Express the given expression as a complex number.

a. $\sqrt{x}(x < 0)$ b. Roots of $x^2 - (2\cos\theta)x + 1 = 0$

**Q.3** Determine the multiplicative inverse of the complex number $3 + 2i$.

**Q.4** Simplify the expression in $i^{n+100} + i^{n+50} + i^{n+48} + i^{n+46}$ where, $n \in I$.

**Q.5** Determine the values of x and y in the real number set $(2 + 3i)x^2 - (3 - 2i)y = 2x - 3y + 5i$

**Q.6** Determine the square root of the complex number $5 + 12i$

**Q.7** Find the solutions for z in the equation $z^2 - (3 - 2i)z = 5i - 5$

**Q.8** Considering x, y R, find the solutions for the equation

$$4x^2 + 3xy + (2xy - 3x^2)i = 4y^2 - (x^2/2) + (3xy - 2y^2)i$$

**Q.9** Represent the complex number $z = -1 + \sqrt{2}i$ in polar form.

**Q.10** Determine the principal argument and modulus $|z|$ for the complex number $z = \frac{-i(9+i)}{2-i}$

**Q.11** Determine the modulus $|z|$ and principal argument of the complex number

$$z = 6(\cos 310^\circ - i \sin 310^\circ)$$

**Q.12** Find the value of the expression $1 + i^2 + i^4 + i^6 + i^8 + \cdots \ldots\ldots + i^{20}$.

**Q.13** Find the multiplicative inverse of $3 + 2i$.

**Q.14** Express $(\frac{1}{3} + 7i) + (9 - 2i) - (-\frac{4}{3} + 2i)$ in the form $a + ib$.

**Q.15** Find the conjugate of $\frac{1}{2-7i}$

**Q.16** Find the principal argument of $2\sqrt{3} - 2i$

**Q.17** Evaluate $(-2 - \frac{1}{4}i)^3$

**Q.18** Find the conjugate of $\frac{(2-3i)^2}{2+i}$

**Q.19** Find the multiplicative inverse of $\frac{2+4i}{(1+i)^2}$

**Q.20** If $z_1, z_2, z_3$ are $2 - 8i, 7 - 8i$ and $1 - i$ respectively, then find the value of $\mathrm{Im}(\frac{z_1\overline{z}_2}{\overline{z}_3})$.

**Q.21** If $z = x + iy$ satisfies $\arg(z - 1) = \arg(z + 3i)$, then find the value of $(x - 1): y$.

**Q.22** If $z_1 = 3 + 2i$ and $z_2 = 5 - 3i$, then show that $z_1\overline{z}_2$ and $\overline{z}_1 z_2$ are conjugates of each other

## ANSWER KEY – LEVEL – I

| Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ana. | b | c | c | c | b | a | a | c | a | a |
| Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Ana. | a | b | b | d | d | d | c | c | d | b |
| Q. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Ana. | d | b | b | b | d | d | c | d | d | c |
| Q. | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| Ana. | c | d | a | c | c | b | a | d | a | c |
| Q. | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| Ana. | b | b | c | b | a | a | c | c | d | b |

## ANSWER KEY – LEVEL – II

**1.** a. $\pm 4i$ b. $-b + I\sqrt{-4ac}$,

**2.** **a.** $0 + i\sqrt{-x}$ b. $(\cos\theta + i\sin\theta)$ , $(\cos\theta - i\sin\theta)$

**3.** $\left(\frac{3}{13} - \frac{2}{13}i\right)$

**4.** 0

**5.** $x = 0, y = \frac{5}{2}$ And $x = 1, y = 1$

**6.** $\pm(3 + 2i)$

**7.** $z = (2 + i)$ and $(1 - 3i)$

**8.** $x = K, y = \frac{3k}{2} K \in R$

**9** $z = \sqrt{3}(\cos\theta + i\sin\theta)$ Where $\theta = \pi - \tan^{-1}\sqrt{2}$

**10.** Principal argument $= -\tan^{-1}\frac{17}{11}$, $|z| = \frac{\sqrt{410}}{5}$

**11.** $|z| = 6$, principal argument $= 50°$