

## Multiple Choice Questions

### Chapter 1

1. If  $n$  is a prime, then  $\sqrt{n}$  is :  
a) Rational number   b) whole number   c) natural number   d) irrational number
2. The additive identity of real number is :  
a) 0      b) 1      c) 2      d) 3
3. The property  $\forall a \in R; a = a$  is called :  
a) Reflexive   b) symmetric      c) transitive      d) commutative
4. For  $a, b \in R, a > b$  or  $a = b$  or  $a < b$  is the :  
a) Trichotomy property of real numbers  
b) Left distributive property of real numbers  
c) Right distributive property of real numbers  
d) Cancellation property of real numbers
5. Transitive property of order of the real numbers is that  $\forall a, b, c \in R$   
a)  $a < b \wedge b < c \Rightarrow a < c$       b)  $a < b \wedge b < c \Rightarrow a = c$   
c)  $a < b \wedge b < c \Rightarrow a \geq c$       d)  $a < b \wedge b < c \Rightarrow a > c$
6. Trichotomy is property of :  
a) division      b) inequality      c) equality      d) subtraction
7.  $\forall a, b \in R, a = b \Rightarrow b = a$ , this property is called :  
a) Transitive   b) symmetric      c) reflexive      d) additive
8. Which of the following sets has closure property with respect to multiplication?  
a)  $\{-1,1\}$       b)  $\{-1\}$       c)  $\{-1,0\}$       d)  $\{0,2\}$
9.  $(-i)^{19}$  is equal to :  
a)  $-i$       b)  $i$       c) 1      d)  $-1$
10. Any real number  $a =$  :  
a)  $ia$    b)  $(0, a)$       c)  $(a, 0)$       d)  $(a, 1)$

11. Multiplicative inverse of  $(a, b)$  is:

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

12. Conjugate of  $-2 + 3i$  is:

- a)  $-2 - 3i$     b)  $2 - 3i$     c)  $2 + 3i$     d)  $-2 + 3i$

13. If  $z = a + ib$ , then  $|\bar{z}| =$ :

- a)  $\sqrt{a^2 - b^2}$     b)  $\sqrt{a^2 - (ib)^2}$     c)  $a^2 + b^2$     d)  $\sqrt{a^2 + b^2}$

14.  $|z^2| =$

- a)  $z^2$     b)  $z\bar{z}$     c)  $\bar{z}^2$     d)  $z$

15.  $(-1)^{\frac{-21}{2}}$  is equal to :

- a)  $-i$     b)  $i$     c)  $1$     d)  $-1$

16. The polar form of a complex number is:

- a)  $r(\tan\theta + icot\theta)$     b)  $r(\sec\theta + i csc\theta)$   
c)  $r(\cos\theta + i \sin\theta)$     d)  $r(\sin\theta + i \cos\theta)$

17.  $\forall n \in \mathbb{Z}, (\cos\theta + i \sin\theta)^n =$

- a)  $\csc n\theta + i \sec n\theta$     b)  $\tan n\theta + i \cot n\theta$   
b)  $\csc n\theta - i \sin n\theta$     d)  $\cos n\theta + i \sin n\theta$

18. The set of negative integers is closed with respect to :

- a) Addition    b) Multiplication    c) Subtraction    d) None of these

b) For all  $x \in R, x = x$ , this property is called:

- a) Reflexive property    b) Symmetric property  
a) Transitive property    d) Trichotomy property

c)  $\sqrt{-1}$  belongs to the set of :

- a) Real numbers    b) Complex numbers  
c) Prime numbers    d) odd numbers

21.  $z = (a, b)$ , then  $z^{-1} =$

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

22. Let  $x, y \in R$  then  $x + iy$  is purely imaginary if :
- a)  $x \neq 0, y = 0$    b)  $x = 0, y = 0$    c)  $x = 0, y \neq 0$    d)  $x \neq 0, y \neq 0$
23. Product of a complex number and its conjugate is:
- a) a real number   b) irrational number   c) a complex number   d) none of these
24. Conjugate of a complex number  $(-a, -b)$  is:
- a)  $(-a, b)$    b)  $(-a, -b)$    c)  $(a, -b)$    d) none of these
25. The additive inverse of a real number  $a$  is :
- a) 0   b)  $-a$    c)  $a$    d)  $\frac{1}{a}$
26. The set of all rational numbers between 2,3 is :
- a) an empty set   b) an infinite set   c) a finite set   d) a power set
27. The multiplicative identity of real numbers is
- a) 0   b) 1   c) 2   d) -1
28.  $z\bar{z} =$  :
- a) 0   b) 1   c)  $|z|^2$    d) none of these
29. Modulus of  $15i + 20$  is :
- a) 20   b) 15   c) 25   d) none of these
30.  $\cos\left(\frac{\pi}{2}\right) + i\sin\left(\frac{\pi}{2}\right)$  in Cartesian form is :
- a) 0   b) 1   c)  $i$    d)  $-i$

1. a
2. a
3. a
4. a
5. a
6. b
7. b
8. a
9. b
10. c
  
11. c
  
12. a
  
13. d
  
14. b
  
15. a
  
16. c
  
17. d
  
18. a
  
19. a
  
20. b
  
21. d
  
22. c
  
23. a
  
24. a
  
25. b
  
26. b
  
27. b
  
28. c
  
29. c
  
30. c

## Ch#1

### (Number Systems)

#### Short Questions

1. Define rational and irrational numbers
2. Define the following properties of the real numbers
  - a) Closure property w.r.t addition
  - b) Associative property w.r.t addition
3. Define complex number and conjugate of a complex number.
4. Prove that the sum as well as the product of any complex number and its conjugate is a real number.
5. Define modulus of a complex number.
6. What is the polar form of a complex number.
7. Simplify the following:
  - a)  $-i^{19}$
  - b)  $-1^{\frac{-21}{2}}$
8. Simplify the following
  - a)  $(7,9) + (3,5)$
  - b)  $(8, -5) - (-7,4)$
  - c)  $(2,6) \cdot (3,7)$
  - d)  $(2,6) \div (3,7)$
9. Find the multiplicative inverse of each of the following numbers
  - a)  $(-4,7)$
  - b)  $(\sqrt{2}, -\sqrt{5})$
  - c)  $(1,0)$
10. Factorize the following:
  - a)  $a^2 + 4b^2$
  - b)  $9a^2 + 16b^2$
  - c)  $3x^2 + 3y^2$
11. Separate into real and imaginary parts
  - a)  $\frac{2-7i}{4+5i}$
  - b)  $\frac{(-2+3i)^2}{(1+i)}$
12. Show that  $\forall z_1, z_2 \in \mathbb{C}, \overline{z_1 z_2} = \overline{z_1} \overline{z_2}$
13. Express the complex number  $1 + i\sqrt{3}$  in polar form.
14. Find real and imaginary part of  $(\sqrt{3} + i)^3$
15. Show that  $\forall Z \in \mathbb{C}, Z^2 + (\overline{Z})^2$
16. Show that  $(z - \overline{z})^2$  is a real number for all  $z \in \mathbb{C}$ .

## Important Definitions

### Chapter #1

**Q1. Define Rational and Irrational Numbers.**

**Ans :** A rational number is a number which can be written in the form of  $\frac{p}{q}$ , where p and q are integers and  $q \neq 0$

**An Irrational number** is a number which cannot be written in the form of  $\frac{p}{q}$ , where p and q are integers and  $q \neq 0$

**Q2. State the commutative property of addition of real numbers.**

**Ans:**  $a + b = b + a, \forall a, b \in R$

**Q3. State the closure property of multiplication of real numbers.**

**Ans:**  $\forall a, b \in R, a \cdot b \in R$  ( a.b is usually written as ab )

**Q4. What is the Trichotomy property of the real numbers?**

**Ans:** If a and b are two real numbers, then exactly one of the following holds:

$$a > b \text{ or } a = b \text{ or } a < b \quad \forall a, b \in R$$

**Q5. Write any two properties of inequalities.**

**Ans: Transitive Property:**  $a > b \wedge b > c \Rightarrow a > c$   $\forall a, b, c \in R$

**Additive Property:**  $a > b \Rightarrow a + c > b + c$   $\forall a, b, c \in R$

**Q6. Define a Complex Number.**

**Ans:** We can define complex numbers also by using ordered pairs.

Let  $C$  be the set of ordered pairs belonging to  $R \times R$  which are subject to the following properties:

- i.  $(a, b) = (c, d) \Leftrightarrow a = c \wedge b = d.$
- ii.  $(a, b) + (c, d) = (a + c, b + d)$
- iii. If  $k$  is any real number, then  $k(a, b) = (ka, kb)$
- iv.  $(a, b)(c, d) = (ac - bd, ad + bc)$  .Then  $C$  is called the set of Complex numbers