PART I : MULTIPLE CHOICE QUESTIONS

1. Which one of the following statements is TRUE?

(a) All integers are natural numbers.
(b) \( \frac{a}{b} \) is the multiplicative inverse of \( \frac{b}{a} \).
(c) \( 8(gh + 5) = 8(hg + 5) \) is true because of the commutative property of multiplication.
(d) \( \pi = \frac{22}{7} \).
(e) If \( a - b = 7 \), then \( 7 = b - a \).

2. Which one of the following statements is FALSE?

(a) The sum of two composite numbers is a composite number.
(b) Every real number is either a rational or irrational.
(c) Every nonnegative integer number is either even or odd.
(d) \( 1 \) is the only positive integer that is not prime and not composite.
(e) The irrational numbers is not closed under addition.

3. Which one of the following statements is TRUE?

(a) \( |y| = y \) for any real number \( y \).
(b) \( |-y| = y \) for any real number \( y \).
(c) \( d(m, m) = 0 \) for any real number \( m \).
(d) \( d(m, n) = -d(n, m) \) for all real numbers \( m \) and \( n \).
(e) \( |x| \) is a positive number.

4. The interval \((-\infty, 0] \cap (-2, \infty)\) can be written as:

(a) \([-2, 0] \).
(b) \(-2 \leq x \leq 0 \).
(c) \(0 \leq x < 2 \).
(d) \(-2 < x < 0 \).
(e) \(-2 < x \leq 0 \).
5. The number 980.665 \times 10^{-2} written in scientific notation is:
   (a) 0.980665 \times 10.
   (b) 0.0980665 \times 10^2.
   (c) 9.80665.
   (d) 9806.5 \times 10^{-4}.
   (e) 98.0665 \times 10^{-1}.

6. The set \{2,0.35,\sqrt{5},-3,-\frac{1}{2},0.341352...,\sqrt{-9}\} contains:
   (a) two natural numbers.
   (b) three integer numbers.
   (c) five rational numbers.
   (d) six real numbers.
   (e) three irrational numbers.

7. Which one of the following is a Polynomial?
   (a) \(x^2 + 3x^{-1} - 5\).
   (b) 0.
   (c) \(\frac{3x-1}{2x}\).
   (d) \((\frac{2}{3})^2\).
   (e) \(5x^3 - 2x + x^\frac{1}{2} - 2\).

8. Which one of the following statements is TRUE?
   (a) \(\frac{5}{x-3} = \frac{2}{x+3}\) is a conditional equation.
   (b) \(|x| = 0\) is a contradiction.
   (c) \((x+3)^2 = x^2 + 9\) is an identity.
   (d) \(x(x + 5) = x^2 + 5(x + 1)\) is a contradiction.
   (e) \(x - 3 = 0\) and \(x^2 = 9\) are equivalent equations.
PART II WRITTEN QUESTIONS:

1. Simplify \((\frac{-2y}{\sqrt{\frac{3y}{x}}})^{2y})^{-4}\) where \(x > 0\) and \(y > 0\). (Write the result without any radicals in the denominator)

2. Find the LCD (Least Common Denominator) of the following expression. (Do not simplify)
   \[
   \frac{x^2 + xy - 3y^2}{x^2 + 3xy - 9y^2} \cdot \frac{2y}{x^2 + x - y} - \frac{5}{3(x-y)}
   \]

3. Rewrite the expression \(-3x^2\sqrt{34x^4} + 2\sqrt{16x^7}\) in the simplest form.

4. Find the solution set of the equation:
   \[
   \frac{4}{2m-1} - \frac{1}{m+1} = \frac{5}{2m-2}
   \]

5. Solve for \(r\) in the equation \(s = \frac{r+x}{1-\phi} \)

6. If \(z = i^{2002} + i^{-1423} + \sqrt{-5}\sqrt{-2}\), then find \(\bar{z}\) (the conjugate of \(z\)). (Note that \(i = \sqrt{-1}\))

7. Write the complex number \(\frac{4+i}{3+i} - \frac{1}{3-i}\) in standard form. (Note that \(i = \sqrt{-1}\))

8. If
   \[
   A = \{x|x \text{ is a composite number less than 18}\}
   \]
   \[
   B = \{x|x \text{ is an even number and } 0 \leq x < 20\}
   \]
   \[
   C = \{x|x \text{ is a prime number not greater than 13}\}
   \]
   (a) List all elements of \(A\), \(B\), and \(C\).
   \[
   A = \]
   \[
   B = \]
   \[
   C = \]
   (b) \((A \cap B) \cup C = \)

9. Write without absolute value notation \(\sqrt[\text{if } x < 0.2]{\frac{|1-x|}{|x-\frac{1}{2}| + |x+\frac{1}{2}|}}\), given \(0 < x < 0.2\).

10. Factor as completely as possible:
   (a) \(4x^2 + 2x - y - y^2\).
   (b) \(64 - x^6\).

11. Simplify the following expressions:
(a) \( \frac{y^2 + 6y + 9}{y^2 + 27} \div \frac{y + 3}{y^2 - 5y + 9} \).

(b) \( (x - 1 - \frac{9}{y}) \div (1 + \frac{2}{y} - \frac{15}{y^2}) \).

(c) \( (\frac{a^{-1}b - ab^{-1}}{a^{-2}b^{-2}})^{-1} \).

12. If the coefficient of \( x^3 \) in the product \( (2x - 3)^3(3x - k) \) is 20, then find the value of \( k \).

13. Find all positive values of \( k \) such that \( 36x^2 + kx + 100 \) is a perfect square trinomial.

14. Rationalize the denominator of \( \frac{6 + \sqrt{6}}{5 + \sqrt{6}} \) and write the result in the simplest form.

15. Find the value of \( \frac{-3^2 + 6 \div \sqrt{(-3)^2} + 2}{2 - \sqrt{(-3)^2}} \).