SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

POLYNOMIAL

Class 09 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 180**

Section A

1. If x + 2 and x -1 are the factors of $x^3 + 10x^2 + mx + n$, then the values of m and n are respectively. **[1]**

   a) 5 and - 3 b) 17 and - 8

   c) 23 and -19 d) 7 and - 18

2. Vikas has ₹$(x^3 + 2ax)$ with this money he can buy exactly (x - 1) jeans or (x + 1) shirts with no money left. How much money Vikas has, if x = 4? **[1]**

   a) ₹ 80 b) ₹ 120

   c) ₹ 30 d) ₹ 60

3. The remainder when $x^4 - y^4$ is divided by x - y is _____. **[1]**

   a) $x^2 - y^2$ b) 0

   c) $2y^4$ d) x + y

4. The remainder obtained when the polynomial p(x) is divided by (b – ax) is **[1]**

   a) $p\left(\frac{-a}{b}\right)$ b) $p\left(\frac{b}{a}\right)$

   c) $p\left(\frac{a}{b}\right)$ d) $p\left(\frac{-b}{a}\right)$

5. The value of $(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3$ is **[1]**

   a) 3(a + b)(b + c)(c + a)(a - b)(b - c)(c - a) b) 3(a - b)(b - c)(c - a)

   c) 3(a + b)(b + c)(c + a) d) 2(a + b)(b + c)(c + a)

6. Which of the following polynomials has (-3) as a zero? **[1]**

   a) $x^2 - 3x$ b) (x – 3)

   c) $x^2 - 9$ d) $x^2 + 3$

7. If one zero of a quadratic polynomial $kx^2 + 4x + k$ is 1, then the value of k is: **[1]**

   a) -4 b) 4

   c) -2 d) 2

8. Degree of a zero polynomial is: **[1]**

   a) 0 b) 1

   c) any real number d) not defined

9. When p(x) = $x^3 + ax^2 + 2x + a$ is divided by x + a, the remainder is **[1]**

a) a
b) 0
c) 1
d) -a

10. The product $(x^2 - 1)(x^4 + x^2 + 1)$ is equal to **[1]**

a) $x^6 - 1$
b) $x^8 + 1$
c) $x^8 - 1$
d) $x^6 + 1$

11. If $x^2 + kx - 3 = (x - 3)(x + 1)$, then the value of 'k' is **[1]**

a) -3
b) 2
c) -2
d) 3

12. The factors of $x^3 - 1 + y^3 + 3xy$ are **[1]**

a) $3(x + y - 1)(x^2 + y^2 - 1)$
b) $(x - 1 + y)(x^2 - 1 - y^2 + x + y + xy)$
c) $(x + y + 1)(x^2 + y^2 + 1 - xy - x - y)$
d) $(x - 1 + y)(x^2 + 1 + y^2 + x + y - xy)$

13. If $a^2 + b^2 + c^2 - ab - bc - ca = 0$, then **[1]**

a) a = b = c
b) a + b = c
c) c + a = b
d) b + c = a

14. If $x + 1$ is a factor of the polynomial $2x^2 + kx + 1$, then the value of 'k' is **[1]**

a) 2
b) -3
c) -2
d) 3

15. If $p(x) = 5x - 4x^2 + 3$ then p(-1) = ? **[1]**

a) -2
b) -6
c) 2
d) 6

16. The factors of $x^2 - 9$ is **[1]**

a) (x - 3)(x - 3)
b) (x + 3)(x + 3)
c) (x + 3) (x - 3)
d) (x - 3)(x + 9)

17. If $x^4 + \frac{1}{x^4} = 623$, then $x + \frac{1}{x}$ = **[1]**

a) 27
b) $-3\sqrt{3}$
c) $3\sqrt{3}$
d) 25

18. Which of the following expressions is not a polynomial? **[1]**

a) $5x^3 - 3x^2 - \sqrt{x} + 2$
b) $5x^3 - 3x^2 - x + \sqrt{2}$
c) $5x^2 - \frac{2}{3}x + 2\sqrt{5}$
d) $\sqrt{5}x^3 - \frac{3}{5}x + \frac{1}{7}$

19. The value of $x^3 - 8y^3 - 36xy - 216$, when $x = 2y + 6$ is **[1]**

a) 0
b) 3
c) 1
d) 2

20. If $x^{51} + 51$ is divided by x + 1, then the remainder is **[1]**

a) 0 b) 51

c) 50 d) 1

21. **Assertion (A):** $P(x) = 4x^3 - x^2 + 5x^4 + 3x - 2$ is a polynomial of degree 3. **[1]**

Reason (R): The highest power of x in the polynomial P(x) is the degree of the polynomial.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

22. **Assertion (A):** If the sum of the zeroes of the quadratic polynomial $x^2 - 2kx + 8$ are is 2 then value of k is 1. **[1]**

Reason (R): Sum of zeroes of a quadratic polynomial $ax^2 + bx + c$ is $-\frac{b}{a}$

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

23. **Assertion (A):** If the graph of a polynomial touches x-axis at only one point, then the polynomial cannot be a quadratic polynomial. **[1]**

Reason (R): A polynomial of degree n(n > 1) can have at most n zeroes.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

24. **Assertion (A):** Number zero itself is known as zero polynomial. **[1]**

Reason (R): Zero polynomial has only one zero.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

25. **Assertion (A):** Polynomial $(x + 1)(x^2 - 4)(x + 5)$ has at most 4 zeroes. **[1]**

Reason (R): Degree of given polynomial is 4.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

26. **Assertion:** Degree of a zero polynomial is not defined. **[1]**

Reason: Degree of a non-zero constant polynomial is 0

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

27. **Assertion (A):** (x + 2) is a factor of $x^3 + 3x^2 + 5x + 6$ and of 2x + 4. **[1]**

Reason (R): If p(x) be a polynomial of degree greater than or equal to one, then (x - a) is a factor of p(x), if p(a) = 0.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

28. **Assertion (A):** Graph of linear polynomial always meets x-axis at 3 points. **[1]**
Reason (R): Degree of linear polynomial is one.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

29. **Assertion (A):** If (x) + 1 is a factor of f(x) = x^2 + ax + 2, then a = -3. **[1]**
Reason (R): If (x - a) is a factor of p(x), if p(a) = 0.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

30. **Assertion (A):** If f(x) = $3x^7$ - $4x^2$ + x + 9 is a polynomial, then its degree is 7. **[1]**
Reason (R): Degree of a polynomial is the highest power of the variable in it.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Section B

31. What must be added to $2x^4$ - $5x^3$ + $2x^2$ - x - 3 so that the result is exactly divisible by (x - 2)? **[2]**
32. Determine the polynomial $x^3 + x^2 + x + 1$ has $(x + 1)$ a factor or not. **[2]**
33. Find the remainder when f(x) = x^3 - $6x^2$ + 2x - 4 is divided by g(x) = 1 - 3x **[2]**
34. Factorise: $27y^3$ + $125z^3$ **[2]**
35. Using the remainder theorem, find the remainder; when p(x) is divided by g(x), where p(x) = $2x^3$ + x^2 - 15x - 12, g(x) = x + 2. **[2]**
36. Use suitable identities to find the following product : (y^2 + $\frac{3}{2}$)(y^2 - $\frac{3}{2}$). **[2]**
37. Factorise: a^3b - a^2b + 5ab - 5b **[2]**
38. Give possible expression for the length and breadth of the rectangle, in which the area is $35y^2 + 13y - 12$ **[2]**
39. Is it polynomial or not? Give reason: r(x) = $\frac{x+3}{x+4}$ **[2]**
40. Find a zero of the polynomial p(x) = 2x + 1 **[2]**
41. Check whether p(x) is a multiple of g(x) or not : p(x) = $2x^3$ - $11x^2$ - 4x + 5, g(x) = 2x + 1 **[2]**
42. Is (x + 1) is a factor of given polynomial p(x) = x^3 - x^2 - (2 + $\sqrt{2}$)x + $\sqrt{2}$? **[2]**
43. For the polynomial $\frac{x^3+2x+1}{5} - \frac{7}{2}x^2 - x^6$, write **[2]**
    i. the degree of the polynomial
    ii. the coefficient of x^3
    iii. the coefficient of x^6

iv. the constant term

44. Find the remainder when the polynomial p(x) = $x^4 + 2x^3 - 3x^2 + x - 1$ is divided by g(x) = x - 2. **[2]**

45. Verify $x = -\frac{1}{3}$ is a zero of the polynomial $p(x) = 3x + 1$ **[2]**

Section C

46. Factorise: $2y^3 + y^2 - 2y - 1$ **[3]**

47. Find whether polynomial g(x) is a factor of polynomial f(x) or not: f(x) = $3x^3 + x^2 - 20x + 12$, g(x) = 3x − 2 **[3]**

48. Find m and n if x - 1 and x - 2 exactly divide the polynomial $x^3 + mx^2 - nx + 10$ **[3]**

49. Factorize: $x^3 - 3x^2 - 9x - 5$ **[3]**

50. Factorize $(x + 2)^3 + (x - 2)^3$ **[3]**

51. Find the value of k, if x - 1 is a factor of p(x) in case: $p(x) = kx^2 - 3x + k$ **[3]**

52. Without actually calculating the cubes, find the value of: $\left(\frac{1}{2}\right)^3 + \left(\frac{1}{3}\right)^3 - \left(\frac{5}{6}\right)^3$ **[3]**

53. Factorize the polynomial: **[3]**

$8a^3 - b^3 - 12a^2b + 6ab^2$

54. Factorise: $\frac{3}{2}x^2 - x - \frac{4}{3}$ **[3]**

55. Factorize the polynomial: **[3]**

$27 - 125a^3 - 135a + 225a^2$

56. Check whether polynomial p(x) = $2x^3 - 9x^2 + x + 12$ is a multiple of 2x - 3 or not. **[3]**

57. Expand $\left(\frac{1}{2}a - \frac{1}{3}b + 1\right)^2$ **[3]**

58. If both x - 2 and $x - \frac{1}{2}$ are factors of $px^2 + 5x + r$, show that p = r. **[3]**

59. Simplify $(2x - 5y)^3 - (2x + 5y)^3$. **[3]**

60. Using identity $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$ derive the formula $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ **[3]**

Section D

61. Find the values of a and b so that the polynomial $(x^4 + ax^3 - 7x^2 - 8x + b)$ is exactly divisible by (x + 2) as well as (x + 3). **[5]**

62. Find k so that $x^2 + 2x + k$ is a factor of $2x^4 + x^3 - 14x^2 + 5x + 6$. Also, find all the zeroes of the two polynomials. **[5]**

63. Using factor theorem, factorize the polynomial: $x^3 + 2x^2 - x - 2$ **[5]**

64. The polynomials $(2x^3 + x^2 - ax + 2)$ and $(2x^3 - 3x^2 - 3x + a)$ when divided by (x - 2) leave the same remainder. Find the value of a. **[5]**

65. What must be added to $x^3 - 6x^2 - 15x + 80$ so that the result is exactly divisible by $x^2 + x - 12$ **[5]**

66. Verify division algorithm for the polynomials p(x) = $3x^4 - 4x^3 - 3x - 1$ and g(x) = x - 2. Find p(2). What do you observe? **[5]**

67. Factorise: $\frac{1}{27}(2x + 5y)^3 + \left(\frac{-5}{3}y + \frac{3}{4}z\right)^3 - \left(\frac{3}{4}z + \frac{2}{3}x\right)^3$ **[5]**

68. If $(ax^3 + bx^2 - 5x + 2)$ has (x + 2) as a factor and leaves a remainder 12 when divided by (x - 2), find the values of a and b. **[5]**

69. Show that (x + 4), (x - 3) and (x - 7) are the factors of $x^3 - 6x^2 - 19x + 84$ **[5]**

70. Using factor theorem, factorize the polynomial: $x^3 - 6x^2 + 3x + 10$ **[5]**

71. If a + b + c = 5 and ab + bc + ca = 10, then prove that $a^3 + b^3 + c^3 - 3abc = -25$ **[5]**

[5]

72. Show that $(x - 2)$, $(x + 3)$ and $(x - 4)$ are the factors of $x^3 - 3x^2 - 10x + 24$

73. If the polynomials $2x^3 + ax^2 + 3x - 5$ and $x^3 + x^2 - 4x + a$ leave the same remainder when divided by x - 2, Find the value of a **[5]**

74. If x = 0 and x = -1 are the zeros of the polynomial $f(x) = 2x^3 - 3x^2 + ax + b$, find the value of a and b. **[5]**

75. Find the integral roots of the polynomial $f(x) = x^3 + 6x^2 + 11x + 6$. **[5]**