SECTION - I

Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C), (D), out of which ONLY ONE is correct. Choose the correct option.

1. If $(x-a)^2$ be a factor of x^3+px+q then

(a) $p=2a^2, q=3a^2$ (b) $p=-3a^2, q=2a^2$

(c) $p=3a^2, q=2a^3$ (d) None

2. The homogeneous function of the second degree in x and y having 2x – y as a factor, taking the value 2 when x = y = 1 and vanishing when x = – 1 and y = 1 is

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

(c) $x^2+xy-2y^2$ (d) None

3. The factor of the polynomial expressions $15-x-16x^2$ are

(a) (3x + 5) and (2x + 3) (b) (5 – 3x) and (2x + 3)

(c) (3 – 2x) and (3x + 5) (d) None

4. The remainder when $7x^3+6x^20x+1$ is divided by x – 2 is

(a) 79 (b) 29 (c) 97 (d) None

5. If $f(x)=x^2, g(x)=x^3$ then the value of $\frac{f(b)-f(a)}{g(b)-g(a)}$

(a) $\frac{a-b}{a^2-ab+b^2}$ (b) $\frac{a+b}{a^2+ab+b^2}$

(c) $\frac{a}{a^2-ab+b^2}$ (d) None

6. The value of P for which x – 4 may be a factor of $5x^2-(P+4)x^2-Px-(P+4)$ is

(a) 2 (b) 12 (c) 8 (d) None

7. If $x-\frac{1}{x}=7$ then the value of the $x^3-\frac{1}{x^3}$ is

(a) 333 (b) 243 (c) 364 (d) None

8. If x^2-3x+2 is a factor of the expression x^4+ax^2+b, then the value of a and b are

(a) $a=-5, b=4$ (b) $a=4, b=-5$

(c) $a=5, b=-4$ (d) None

9. If $a+b+c=6, bc+ca+ab=11, abc=6$, then the value of $(1-a)(1-b)(1-c)$ is

(a) 1 (b) -1 (c) 0 (d) None

10. If $x=\frac{a}{b+c}, y=\frac{b}{c+a}, z=\frac{c}{a+b}$ the value of $xy+yz+zx+2xyz$ is

(a) 1 (b) 2 (c) 3 (d) None

11. One of the factor of $8x^3+125y^3$

(a) $2x-5y$ (b) $2x-5y$ (c) $x-2y$ (d) None

12. The remainder when the polynomial $P(x)=x^4-3x^2+2x+1$ is divided by x – 1 is

(a) 2 (b) 1 (c) – 1 (d) 3

13. If the polynomial ax^3+4x^2+3x-4 and x^3+4x-a leave the same remainder when divided by x – 3 then the value of a is

(a) 2 (b) 1 (c) – 1 (d) 3

14. If $f(x)=x^4-2x^3+3x^2-ax+b$ is a polynomial such that when it is divided by x – 1 and x + 1, the remainders are respectively 5 and 9. Then the remainder when f(x) is divided by x – 2 is

(a) 2 (b) 7 (c) 8 (d) 15

15. One of the factor of the polynomial $x^3-3x^2+4x-12$ is

(a) $x-3$ (b) $x-2$ (c) $x-1$ (d) $x-4$

16. The value of K, if x + 3 is as factor of $3x^2+K$ is

(a) – 2 (b) 4 (c) – 27 (d) 8

17. The value of a so that polynomial x^3+10x^2+ax+6 is exactly divisible by x – 1 as well as x - 2 is

(a) – 37 (b) 26 (c) 45 (d) 14

18. If $2x^3+ax^2+11x+a+3$ is exactly divisible by 2x – 1 then the value of a is?

(a) 7 (b) – 7 (c) 6 (d) 5

19. If both x – 2 and $x-\frac{1}{2}$ are factor of px^2+5x+r then

(a) p = r (b) $p=\frac{1}{2}$ (c) p = - r (d) None

20. If x^2-a is a factor of $ax^4+bx^3+cx^2+dx+e$ then

(a) $a+c=b+d$ (b) $a+c+e=b+d$

(c) $a=c, b=d$ (d) None

21. The remainder when $f(x)=x^3-6x^2+2x-4$ is divisible by g(x) = 3x – 1 is

(a) $\frac{3}{2}$ (b) 1 (c) $\frac{-107}{27}$ (d) 4

22. The polynomials ax^3+3x^2-13 and $2x^3-5x+a$ are divided by x + 2. If the remainder in each case is the same, then the value of a is?

(a) 1 (b) $\frac{5}{9}$ (c) $\frac{3}{4}$ (d) $\frac{7}{5}$

23. Let R_1 and R_2 be the remainder when the polynomials $x^3+2x^2-5ax-7$ and $x^3+ax^2-12x+6$ are divided by x + 1 and x – 2 respectively. If $2R_1+R_2=6$ then the value of a is

(a) 1 (b) 2 (c) 3 (d) 4

24. Common factor for the polynomials $x^{10}-1$ and $x^{11}-1$ is

(a) x - 1 (b) x + 1 (c) x – 2 (d) x – 4

25. The value of K if x + 3 is a factor of $3x^2+kx+6$ is

(a) 10 (b) – 11 (c) 8 (d) 9

26. For what value of a is $2x^3+ax^2+11x+a+3$ exactly divisible by 2x – 1

(a) – 7 (b) 4 (c) 5 (d) 8

27. One of the factors of the polynomial $a\left(b^2-c^2\right)+b\left(c^2-a^2\right)+c\left(a^2-b^2\right)$ is

(a) a – b (b) b – a (c) b – 1 (d) a – 1

28. If x + a is a factor of $x^3+ax^2-2x+a+4$, then the value of a is

(a) 1 (b) 0 (c) 2 (d) 4

29. x + a is a fatcor of x^n+a^n

(a) $n\in N$

(b) for any odd positive integer

(c) for any even positive integer

(d) None

30. One of t5he factor of $\left(x-b\right)^5+\left(b-a\right)^5$ is

(a) a – b (b) x – b (c) x – a (d) a + x

SECTION - II

Assertion - Reason Questions

This section contains certain number of questions. Each question contains STATEMENT-1 (Assertion) and STATEMENT - 2 (Reason). Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct. Choose the correct option.

31. STATEMENT-1: $x^2+2xy+4y^2$ is one of the factor of $8x^3+125y^3$

because

STATEMENT - 2: $x^3+y^3=\left(x+y\right)\left(x^2-xy+y^2\right)$

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a

correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

32. STATEMENT-1: $\frac{x^2}{y^2}+2+\frac{y^2}{x^2}=\left(\frac{x}{y}+\frac{y}{x}\right)^2$

because

STATEMENT - 2: $(a+b)^2=a^2+b^2+2ab$

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

33. STATEMENT-1: x – 3 is a factor of the polynomial $x^3-3x^2+4x-12$

because

STATEMENT - 2: x – a is a factor of the polynomial P(x) then P(a) = 0

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

34. STATEMENT-1: x + 1 and 2x – 3 are factor of $2x^3-9x^2+x+12$

because

STATEMENT-2: a – b, b – c , c – a are the factor of

$a\left(b^2-c^2\right)+b\left(c^2-a^2\right)+c\left(a^2-b^2\right)$

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

35. STATEMENT-1: $x^4+2x^3-13x^2-14x+24=(x-1)(x+2)$

$(x-3)(x+4)$

because

STATEMENT- 2: If sum of the coefficient of all the term of a polynomial is zero then x – 1 is a factor.

(a) Statement-1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement-1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

36. STATEMENT-1: $3x^3-5x^2+8x+9$ is a polynomial in x of degrees.

because

STATEMENT - 2: The highest power of x in an algebraic expression is called the degree of the polynomial.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a

correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

37. STATEMENT-1: x + 5 is a factor of x^2+6x+5

because

STATEMENT - 2: A polynomial P(x), if g(x) divides P9x) exactly

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

38. STATEMENT-1: One of the factors of ax – by + by – ay is a + b

because

STATEMENT - 2: $a^2-2ab+b^2=(a+b)^2$

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

39. STATEMENT-1: $\dfrac{(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$

$=(a+b)(b+c)(c+a)$

because

STATEMENT-2: One of the factors for $(x-2y)^3+(2y-3z)^3+(3z-x)^3$ is x – 2y.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

40. STATEMENT-1: If a polynomial P(x) is divided by ax + b, the remainder is the value of P(x) at $x=\frac{-b}{a} ie., P\left(\frac{-b}{a}\right)$

because

STATEMENT-2: (x – a) (x – b) is a factor of a polynomial P(x) if P(a) = 0 and P(b) = 0.

(a) Statement - 1 is True, Statement - 2 is True; Statement - 2 is a correct explanation for statement - 1

(b) Statement - 1 is True, Statement - 2 is True; Statement - 2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement - 2 is True

SECTION - III

Linked Comprehension Type

This section contains paragraphs. Based upon each paragraph multiple choice questions have to be answered. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. Choose the correct option.

A light ray makes an angle of incidence 60°, when it falls on a plane reflecting sheet

If $ax^3 + bx^2 + x - b$ has x + 2 as a factor and leaves a remainder 4 when divided by x – 2 then

41. The value of a is

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

42. The value of b is

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

43. One of the factor of $ax^3 + bx^2 + x - 6$ is

(a) x + 1 (b) x + 2 (c) x + 3 (d) None

Paragraph for Question Nos. 44 to 46

$a^2 + 2ab + b^2 = (a+b)^2, a^2 - 2ab + b^2 = (a-b)^2$

(a) Here the first and third terms are perfect squares.

(b) The middle term = 2 (Product of square roots of first and third term.

44. One of the factors of $\frac{x^2}{4y^2} - \frac{2}{3} + \frac{4y^2}{9x^2}$ is

(a) $\left(\frac{x}{2y} - \frac{2y}{3x}\right)^2$ (b) $\left(\frac{x}{2y} - \frac{y}{3x}\right)^2$

(c) $\left(\frac{x}{2y}+\frac{2y}{3x}\right)^2$ (d) None

45. $25(3x-4y)^2-K(9x^2+16y^2)+16(3x+4y)^2$ is a perfect square then the value of K is

(a) 20 (b) 24 (c) 40 (d) 34

46. If $\left(x^2-\frac{1}{x^2}\right)-4\left(x-\frac{1}{x}\right)+K$ is a perfect square, then the value of K is

(a) 4 (b) 6 (c) 5 (d) 7

Paragraph for Question Nos. 47 to 49

Let f(x) be polynomial in x of degree not less than 1 and α be a real number. If f(x) is divided by $(x-\alpha)$ then the remainder is $f(\alpha)$. If $x-\alpha$ is a factor of $f(x)$ then $f(\alpha)=0$

47. The remainder, when $f(x)=x^2+4x+5$ is divided by x – 5 is

(a) 50 (b) $\frac{-3}{8}$ (c) 0 (d) 4

48. The remainder, when $f(x)=x^3+5x-3$ is divided by 2x – 1 is

(a) 50 (b) $\frac{-3}{8}$ (c) 0 (d) 4

49. The remainder when $(a-b)x^2+(b-c)x+c-a$ is divided by x – 1

(a) 50 (b) – 318 (c) 0 (d) 4

Paragraph for Question Nos. 50 to 52

Factorization of algebraic expressions of the form $a^3+b^3+c^3$ when a + b + c = 0 $a^3+b^3+c^3=3abc$ if a + b + c = 0

Hence a, b, c are the factors of $a^3+b^3+c^3$ if a + b + c = 0

50. One of the factors of $(x-y)^3+(y-z)^3+(z-x)^3$ is

(a) x – y (b) x + y + z (c) x – y + z (d) None

51. One of the factors of $P^3(q-r)^3+q^3(r-p)^3+r^3(p-q)^3$ is

(a) p + q (b) p – q (c) p – q + r (d) p – q + r

52. One of the factors of $(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3$ is

(a) a – b (b) a + b – c (c) b – c + a (d) b + c – a

Paragraph for Question Nos. 53 to 55

If is any real number, then the largest integer, which does not exceed x is called the integer part of x, the integer [x] is after called the bracket function/step function.

$(a-b)^3=a^3-3a^2b+3ab^2-b^3=a^3-b^3-3ab(a-b)$

53. If $\frac{x^2-1}{x}=4$ the value of $\frac{x^6-1}{x^3}$ is

(a) 76 (b) 27 (c) 0 (d) 37

54. The value of $216-144x+108x^2-27x^3$ when x = 3

(a) 76 (b) 27 (c) 0 (d) 37

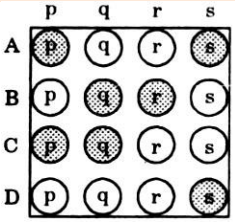
55. The value of $(6a-5b)^3-(3a-4b)^3-3(3a-b(6a-5b(3a-4b)))$ when 3a – b = 0 is

(a) 76 (b) 27 (c) 0 (d) 37

SECTION - IV
Matrix - Match Type

This section contains Matrix-Match type questions. Each question contains statements given in two columns which have to be matched. Statements (a, b, c, d) in Column I have to be matched with statements (p, q, r, s) in Column II. The answers to these questions have to be appropriately bubbled as illustrated in the following example.

If the correct matches are a-p, a-s, b-q, b-r, c-p, c-q and d-s, then the correctly bubbled 4 x 4 matrix should be as follows:



56.

Column I	**Column II**
(a) If $a-\frac{1}{a}=3$ the value of $a^3-\frac{1}{a^3}$	(p) 140
(b) If $C-\frac{1}{C}=5$ the value of $C^3-\frac{1}{C^3}$	(q) 36
(c) If $x-\frac{1}{x}=P$ the value of $x^3-\frac{1}{x^3}$	(r) 4
(d) If $\frac{a^r-1}{a}$ the value of $\frac{a^6}{a^3}$	(s) P^3+3P

57.

Column I	Column II
(a) $\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{x}}}}=\dfrac{4}{3}$ then x is	(p) $\dfrac{1+2x}{2+3x}$
(b) If $\dfrac{1}{x+\dfrac{1}{1+\dfrac{x+1}{2x}}}=1$ then x is	(q) 1
(c) $\dfrac{2x}{1+\dfrac{1}{1+\dfrac{x}{1\ x}}}=1$ then x is	(r) $\dfrac{2}{3}$
(d) $1+\dfrac{1}{2+\dfrac{1}{3+\dfrac{1}{x}}}=\dfrac{13}{9}$ then x is	(s) $\dfrac{1}{8}$

58.

Column I	Column II
(a) $\dfrac{bc}{(a-b)(a-c)}+\dfrac{ca}{(b-c)(b-a)}+\dfrac{ab}{(c-a)(c-b)}$	(p) 1
(b) The value of $\dfrac{x+2a}{x-2a}+\dfrac{x+2b}{x-2b}$	(q) 2

when $x = \frac{4ab}{a+b}$

(c) If x + y + z = 15, xy + yz + zx = 75 (r) 0

then the value of $x^3 + y^3 + z^3 - 3xyz$

(d) If $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{1}{a+b+c}$ then (d) $\frac{1}{(a+b+c)^7}$

Is $\frac{1}{a^7} + \frac{1}{b^7} + \frac{1}{c^7}$

59.

Column I	**Column II**
(a) The remainder when $x^3 + x^2 - 2x + 1$ is divided by x – 3	(p) 50
(b) The remainder when $4x^3 - 3x^2 + 2x - 1$ is divided by x + 2	(q) – 49
(c) The remainder when $x^2 + 4x + 5$ is divided by x – 5	(r) 31
(d) The remainder when $x^2 + 5x - 3$ is divided by 2x – 1	(s) – 318

56. Find the value if

Column I	**Column II**
(a) $a^2 + 2b + ab + 2a$	(p) (a + b) (a + 2)
(b) $2b^2 + 8ab + 4ac + bc$	(q) (x + yz) (xz + y)
(c) $6pm + 9mp + 8pn + 12qn$	(r) (2p + 31) (3m + 4n)
(d) $xy(z^2 + 1) + z(x^2 + y^2)$	(s) (2b + c) (b + 4a)