ARTHI EDUCATIONAL CENTRE

unit - 3 Annual

10th Standard

Maths

Date : 11-Jan-24

Reg.No. :

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Exam Time : 03:00:00 Hrs

Total Marks : 100

I. Answer All Question

22 x 1 = 22

1) A system of three linear equations in three variables is inconsistent if their planes

(a) intersect only at a point   (b) intersect in a line   (c) coincides with each other   (d) do not intersect

2) The solution of the system x + y − 3z = −6, −7y + 7z = 7, 3z = 9 is

(a) x = 1, y = 2, z = 3   (b) x = −1, y = 2, z = 3   (c) x = −1, y = −2, z = 3   (d) x = 1, y = -2, z = 3

3) If (x - 6) is the HCF of x^2 - 2x - 24 and x^2 - kx - 6 then the value of k is

(a) 3   (b) 5   (c) 6   (d) 8

4) $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

(a) $\frac{9y}{7}$ (b) $\frac{9y^2}{(21y-21)}$ (c) $\frac{21y^2-42y+21}{3y^2}$ (d) $\frac{7(y^2-2y+1)}{y^2}$

5) $y^2 + \frac{1}{y^2}$ is not equal to

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

6) $\frac{x}{x^2-25} - \frac{8}{x^2+6x+5}$ gives

(a) $\frac{x^2-7x+40}{(x-5)(x+5)}$ (b) $\frac{x^2+7x+40}{(x-5)(x+5)(x+1)}$ (c) $\frac{x^2-7x+40}{(x^2-25)(x+1)}$ (d) $\frac{x^2+10}{(x^2-25)(x+1)}$

7) The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to

(a) $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ (b) $16\left|\frac{y^2}{x^2z^4}\right|$ (c) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ (d) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

8) Which of the following should be added to make x^4 + 64 a perfect square

(a) $4x^2$ (b) $16x^2$ (c) $8x^2$ (d) $-8x^2$

9) The solution of $(2x - 1)^2$ = 9 is equal to

(a) -1   (b) 2   (c) -1, 2   (d) None of these

10) The values of a and b if $4x^4$ - $24x^3$ + $76x^2$ + ax + b is a perfect square are

(a) 100, 120   (b) 10, 12   (c) -120, 100   (d) 12, 10

11) If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$, then q, p, r are in _____.

(a) A.P   (b) G.P   (c) Both A.P and G.P   (d) none of these

12) Graph of a linear equation is a _____

(a) straight line   (b) circle   (c) parabola   (d) hyperbola

13) The number of points of intersection of the quadratic polynomial x^2 + 4x + 4 with the X axis is

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

14)
For the given matrix A = $\begin{pmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 9 & 11 & 13 & 15 \end{pmatrix}$ the order of the matrix A^T is

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

15) If A is a 2 x 3 matrix and B is a 3 x 4 matrix, how many columns does AB have

(a) 3   (b) 4   (c) 2   (d) 5

16) If number of columns and rows are not equal in a matrix then it is said to be a

(a) diagonal matrix   (b) rectangular matrix   (c) square matrix   (d) identity matrix

17) Transpose of a column matrix is

(a) unit matrix   (b) diagonal matrix   (c) column matrix   (d) row matrix

18) Find the matrix X if 2X + $\begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$

(a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

19)
Which of the following can be calculated from the given matrices A = $\begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}$, B = $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$,

(i) A^2

(ii) B^2

(iii) AB

(iv) BA

(a) (i) and (ii) only   (b) (ii) and (iii) only   (c) (ii) and (iv) only   (d) all of these

20)
If A = $\begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}$, B = $\begin{pmatrix} 1 & 0 \\ 2 & -1 \\ 0 & 2 \end{pmatrix}$ and C = $\begin{pmatrix} 0 & 1 \\ -2 & 5 \end{pmatrix}$, Which of the following statements are correct?

(i) AB + C = $\begin{pmatrix} 5 & 5 \\ 5 & 5 \end{pmatrix}$

(ii) BC = $\begin{pmatrix} 0 & 1 \\ 2 & -3 \\ -4 & 10 \end{pmatrix}$

(iii) BA + C = $\begin{pmatrix} 2 & 5 \\ 3 & 0 \end{pmatrix}$

(iv) (AB)C = $\begin{pmatrix} -8 & 20 \\ -8 & 13 \end{pmatrix}$

(a) (i) and (ii) only   (b) (ii) and (iii) only   (c) (iii) and (iv) only   (d) all of these

21) If ΔABC is an isosceles triangle with right angle C = 90° and AC = 5cm, then AB is _____

(a) 2.5cm   (b) 5cm   (c) 10cm   (d) 4√2cm

22) The G.C.D. of a^m, a^{m+1}, a^{m+2} is :

(a) a^m (b) a^{m+1} (c) a^{m+2} (d) 1

II. Answer All Question

45 x 2 = 90

23) Find the square root of the following expressions

$256(x - a)^8 (x - b)^4 (x - c)^{16} (x - d)^{20}$

24) Find the sum and product of the roots for each of the following quadratic equations

$x^2 + 3x - 28 = 0$

25) Determine the nature of roots for the following quadratic equation. $2x^2 - x - 1 = 0$

26) Solve $3p^2 + 2\sqrt{5}p - 5 = 0$ by formula method.

27) Determine the nature of the roots for the following quadratic equations

$15x^2 + 11x + 2 = 0$

28) If α, β are the roots of the equation $3x^2 + 7x - 2 = 0$, find the values of
$\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

29) Find the value of a, b, c, d from the equation $\begin{pmatrix} a - b & 2a + c \\ 2a - b & 3c + d \end{pmatrix} = \begin{pmatrix} 1 & 5 \\ 0 & 2 \end{pmatrix}$

30)
If A = $\begin{bmatrix} 5 & 4 & 3 \\ 1 & -7 & 9 \\ 3 & 8 & 2 \end{bmatrix}$ then find the transpose of A.

31) If A = $\begin{bmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & \frac{5}{2} \\ 8 & 3 & 1 \end{bmatrix}$ then verify $(A^T)^T = A$

32) Find the values of x, y and z from the following equations

$\begin{bmatrix} 12 & 3 \\ x & \frac{3}{2} \end{bmatrix} = \begin{bmatrix} y & z \\ 3 & 5 \end{bmatrix}$

33) If A = $\begin{bmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{bmatrix}$, B = $\begin{bmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{bmatrix}$ then Find 2A + B.

34) Find the value of a, b, c, d, from the following matrix equation.

$\begin{bmatrix} d & 8 \\ 3b & a \end{bmatrix} + \begin{bmatrix} 3 & a \\ -2 & -4 \end{bmatrix} = \begin{bmatrix} 2 & 2a \\ b & 4c \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ -5 & 0 \end{bmatrix}$

35) If A = $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ prove that $AA^T = I$.

36) Find the LCM of the following

$x^4 - 1$, $x^2 - 2x + 1$

37) Find the LCM of the following

$x^3 - 27$, $(x - 3)^2$, $x^2 - 9$.

38) Find the excluded values of the following expressions (if any).

$\frac{7p+2}{8p^2+13p+5}$

39) Simplify

$\frac{x+2}{4y} \div \frac{x^2-x-6}{12y^2}$

40) Find the values of x, y and z from the following equations.

$\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$

41) Find the values of x, y, z if

$\begin{bmatrix} x & y-z & z+3 \end{bmatrix} + \begin{bmatrix} y & 4 & 3 \end{bmatrix} = \begin{bmatrix} 4 & 8 & 16 \end{bmatrix}$

42) If $P = \frac{x}{x+y}, Q = \frac{y}{x+y}$, then find $\frac{1}{p^2-q^2}$

43) Solve the following quadratic equations by factorization method

$2x^2 - x + \frac{1}{8} = 0$

44) Find the excluded values, if any of the following expressions.

$\frac{x^2+6x+8}{x^2+x-2}$

45) Solve the following quadratic equations by formula method

$3y^2 - 20y - 23 = 0$

46) Determine the nature of roots for the following quadratic equations

$9x^2 - 24x + 16 = 0$

47) Determine the nature of roots for the following quadratic equations

$2x^2 - 2x + 9 = 0$

48) If α and β are the roots of $x^2 + 7x + 10 = 0$ find the values of $α^3 - β^3$

49) Simplify $\frac{1}{x^2-5x+6} + \frac{1}{x^2-3x+2} - \frac{1}{x^2-8x+15}$

50) Find the square root of the following

$(4x^2 - 9x + 2)(7x^2 - 13x - 2)(28x^2 - 3x - 1)$

51) Find the LCM of the given expressions.

$(2x^2 - 3xy)^2$, $(4x - 6y)^3$, $8x^3 - 27y^3$

52) Find the LCM and GCD for the following and verify that f(x) x g(x) = LCM x GCD

$(x^3 - 1)(x + 1)$, $(x^3 + 1)$

53) Find the LCM and GCD for the following and verify that f(x) x g(x) = LCM x GCD

$(x^2y + xy^2)$, $(x^2 + xy)$

54) Find the values of x, y and z from the following equations.

$\begin{bmatrix} x+y & 2 \\ 5+x & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$

55) Reduce the rational expressions to its lowest form

$\frac{x^2-16}{x^2+8x+16}$

56) Find the excluded values, if any of the following expressions.

$\frac{x^3-27}{x^3+x^2-6x}$

57) If A = $\begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 1 & -3 \\ 2 & 5 \end{bmatrix}$ find AB, BA and check if AB = BA?

58) Determine the nature of the roots for the following quadratic equations

$9a^2b^2x^2 - 24abcdx + 16c^2d^2 = 0$, a ≠ 0, b ≠ 0

59) Find the sum and product of the roots for each of the following quadratic equations:

$x^2 + 8x - 65 = 0$

60) If α and β are the roots of $x^2 + 7x + 10 = 0$ find the values of

$α^2 + β^2$

61) If α and β are the roots of $x^2 + 7x + 10 = 0$ find the values of

$α^4 + β^4$

62) If α and β are the roots of $x^2 + 7x + 10 = 0$ find the values of

$\frac{α}{β} + \frac{β}{α}$

63) Find the LCM of the given expressions.

$p^2 - 3p + 2, p^2 - 4$

64) Find the LCM of the following

$5x - 10, 5x^2 - 20$

65) If a matrix has 16 elements, what are the possible orders it can have?

66) Solve the following quadratic equations by formula method

$2x^2 - 5x + 2 = 0$

67) Determine the quadratic equations, whose sum and product of roots are

$\frac{5}{3}$, 4

III. Answer All Question

50x 5 =260

68) Solve the following system of linear equations in three variables

x + y + z = 5; 2x - y + z = 9; x - 2y + 3z = 16

69) Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$

70) If α, β are the roots of $7x^2 + ax + 2 = 0$ and if β - α = $\frac{-13}{7}$. Find the values of a.

71) Solve $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$

72) If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ show that $A^2 - (a + d) A = (bc - ad)I_2$

73) If $A = \begin{bmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{bmatrix}, B = \begin{bmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{bmatrix}$ verify that $(AB)^T = B^T A^T$

74) Solve the following system of linear equations in three variables

x + 20 = $\frac{3y}{2}$ + 10 = 2x + 5 = 110 - (y + z)

75) Construct a 3 x 3 matrix whose elements are given by

$a_{ij} = \frac{(i+j)^3}{3}$

76) If A = $\begin{bmatrix} 1 & 8 & 3 \\ 3 & 5 & 0 \\ 8 & 7 & 6 \end{bmatrix}$, B = $\begin{bmatrix} 8 & -6 & -4 \\ 2 & 11 & -3 \\ 0 & 1 & 5 \end{bmatrix}$, C = $\begin{bmatrix} 5 & 3 & 0 \\ -1 & -7 & 2 \\ 1 & 4 & 3 \end{bmatrix}$ compute the following

$\frac{1}{2}A - \frac{3}{2}B$

77) Find the values of m and n if the following polynomials are perfect squares

$36x^4 - 60x^3 + 61x^2 - mx + n$

78) If the equation (1+ $m^2)x^2$ + 2mcx + $c^2 - a^2$ = 0 has equal roots, then prove that $c^2 = a^2 (1 + m^2)$.

79) The product of Kumaran's age (in years) two years ago and his age four years from now is one more than twice his present age. What is his present age?

80) A ladder 17 feet long is leaning against a wall. If the ladder, vertical wall and the floor from the bottom of the wall to the ladder form a right triangle, find the height of the wall where the top of the ladder meets if the distance bet015 bottom of the wall to bottom of the ladder is 7 feet less than the height of the wall?

81) Find the square root of the following polynomials by division method

$x^4 - 12x^3 + 42x^2 - 36x + 9$

82) A girl is twice as old as her sister. Five years hence, the product of their ages (in years) will be 375. Find their present ages.

83) Find x and y if $x \begin{bmatrix} 4 \\ -3 \end{bmatrix} + y \begin{bmatrix} -2 \\ 3 \end{bmatrix} = \begin{bmatrix} 4 \\ 6 \end{bmatrix}$

84) Solve for x, y : $\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} + 2 \begin{bmatrix} -2x \\ -y \end{bmatrix} = \begin{bmatrix} -5 \\ 8 \end{bmatrix}$

85) Simplyfy

$\frac{p^2-10p+21}{p-7} \times \frac{p^2+p-12}{(p-3)^2}$

86) If A = $\begin{bmatrix} 1 & -1 & 2 \end{bmatrix}$, B = $\begin{bmatrix} 1 & -1 \\ 2 & 1 \\ 1 & 3 \end{bmatrix}$ and C = $\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ show that (AB)C = A(BC)

87) If A = $\begin{bmatrix} 1 & 1 \\ -1 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 1 & 2 \\ -4 & 2 \end{bmatrix}$, C = $\begin{bmatrix} -7 & 6 \\ 3 & 2 \end{bmatrix}$ verify that A(B + C) = AB + AC

88) Simplify

$\frac{2a^2+5a+3}{2a^2+7a+6} \div \frac{a^2+6a+5}{-5a^2-35a-50}$

89) Find the square root of the following rational expressions.

$\frac{121(a+b)^8(x+y)^8(b-c)^8}{81(b-c)^4(a-b)^{12}(b-c)^4}$

90) Find the square root of the following

$9x^2$ - 24xy + 30xz - 40yz + $25z^2$ + $16y^2$

91) Find the square root of the following polynomials by division method

$37x^2$ - $28x^3$ + $4x^4$ + 42x + 9

92) Find the square root of the following polynomials by division method

$121x^4$ - $198x^3$ - $183x^2$ + 216x + 144

93) Find the values of a and b if the following polynomials are perfect squares

ax^4 + bx^3 + $361x^2$ + 220x + 100

94) Find the values of m and n if the following expressions are perfect sqaures

x^4 - $8x^3$ + mx^2 + nx + 16

95) Subtract $\frac{1}{x^2+2}$ from $\frac{2x^3+x^2+3}{(x^2+2)^2}$

96) If A = $\frac{x}{x+1}$, B = $\frac{1}{x+1}$, prove that $\frac{(A+B)^2+(A-B)^2}{A \div B} = \frac{2(x^2+1)}{x(x+1)^2}$

97) Iniya bought 50 kg of fruits consisting of apples and bananas. She paid twice as much per kg for the apple as she did for the banana. If Iniya bought Rs. 1800 worth of apples and Rs. 600 worth bananas, then how many kgs of each fruit did she buy?

98) Discuss the nature of solutions of the following system of equations

x + 2y - z = 6; -3x - 2y + 5z = -12; x - 2z = 3

99) The sum of the digits of a three-digit number is 11. If the digits are reversed, the new number is 46 more than five times the former number. If the hundreds digit plus twice the tens digit is equal to the units digit, then find the original three digit number?

100) A passenger train takes 1 hr more than an express train to pradal a distance of 240 km from Chennai to Virudhachalam. The speed of passenger train is less than that of an express train by 20 km per hour. Find the average speed of both the trains.

101) If $9x^4$ + $12x^3$ + $28x^2$ + ax + b is a perfect square, find the values of a and b.

102) Find the GCD of each pair of the following polynomials

$12(x^4 - x^3)$, $8(x^4 - 3x^3 + 2x^2)$ whose LCM is $24x^3 (x - 1) (x - 2)$

103) If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that A^2 - 5A + $7I_2$ = 0

104) Find X and Y if X + Y = $\begin{bmatrix} 7 & 0 \\ 3 & 5 \end{bmatrix}$ and X - Y = $\begin{bmatrix} 3 & 0 \\ 0 & 4 \end{bmatrix}$

105) Let A = $\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$, B = $\begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$ Show that $(A - B)^T = A^T - B^T$

106) Simplify

$\frac{b^2+3b-28}{b^2+4b+4} \div \frac{b^2-49}{b^2-5b-14}$

107) If x = $\frac{a^2+3a-4}{3a^2-3}$ and y = $\frac{a^2+2a-8}{2a^2-2a-4}$ find the value of x^2y^{-2}

108) The number of volleyball games that must be scheduled in a league with n teams is given by G(n) = $\frac{n^2-n}{2}$ where each team plays with every other team exactly once. A league schedules 15 games. How many teams are in the league?

109) If A = $\frac{2x+1}{2x-1}$, B = $\frac{2x-1}{2x+1}$ find $\frac{1}{A-B} - \frac{2B}{A^2-B^2}$

110) Find the GCD of each pair of the following polynomials

$(x^3 + y^3)$, $(x^4 + x^2y^2 + y^4)$ whose LCM is $(x^3 + y^3)(x^2 + xy + y^2)$

111) The sum of thrice the first number, second number and twice the third number is 5. If thrice the second number is subtracted from the sum of first number and thrice the third we get 2. If the third number is subtracted from the sum of twice the first, thrice the second, we get 1. Find the numbers.

112) Find the square root of the following expressions

$16x^2$ + $9y^2$ - 24xy + 24x - 18y + 9

113) Vani, her father and her grand father have an average age of 53. One-half of her grand father's age plus one-third of her father's age plus one fourth of Vani's age is 65. Four years ago if Vani's grandfather was four times as old as Vani then how old are they all now?

114) There are 12 pieces of five, ten and twenty rupee currencies whose total value is Rs.105. When first 2 sorts are interchanged in their numbers its value will be increased by Rs.20. Find the number of currencies in each sort.

115) Find the GCD of the given polynomials

$3x^3 + 3x^2 + 3x + 3$, $6x^3 + 12x^2 + 6x + 12$

116) Find the GCD of the polynomials $x^3 + x^2 - x + 2$ and $2x^3 - 5x^2 + 5x - 3$.

117) Find the GCD of $6x^3 - 30x^2 + 60x - 48$ and $3x^3 - 12x^2 + 21x - 18$.

IV. Answer All Question

10 x 8 = 80

118) Discuss the nature of solutions of the following quadratic equations.

$x^2 + x - 12 = 0$

119) Draw the graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9 = 0$

120) Draw the graph of $y = x^2 + 3x + 2$ and use it to solve $x^2 + 2x + 1 = 0$

121) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$

122) Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$

123) Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$

124) Draw the graph of $y = (x - 1) (x + 3)$ and hence solve $x^2 - x - 6 = 0$

125) Graph the following quadratic equations and state their nature of solutions.

$x^2 - 4x + 4 = 0$

126) Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6 cm.

Diameter (x)cm	1	2	3	4	5
Circumference (y)cm	3.1	6.2	9.3	12.4	15.5

127) A two wheeler parking zone near bus stand charges as below

Time in hours (x)	4	8	12	24
Amount $Rs.$ (y)	60	120	180	360

Check if the amount charged are in direct variation or in inverse variation to the parking time. Graph the data. Also

(i) find the amount to be paid when parking time is 6 hr;

(ii) find the parking duration when the amount paid is Rs. 150.

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