ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN, PALANI.

DEPARTMENT OF MATHEMATICS

ALLIED MATHEMATICS I :

THEORY OF EQUATIONS, MATRICES, FINITE DIFFERENCES,

TRIGONOMETRY AND DIFFERENTIAL CALCULUS

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ALLIED MATHEMATICS - I

THEORY OF EQUATIONS, MATRICES, FINITE DIFFERENCES, TRIGONOMETRY AND DIFFERENTIAL CALCULUS

Unit I

1. $f(x) = a_0x^n + a_1x^{n-1} + \ldots + a_n = 0$ is called an ---------- of the ^{nth} degree, if $a_0 \neq 0$.
(Ans : Algebraic Equation).
2. If an equation f(x) = 0 remains unaltered when x is changed to 1/x, then it is called a ----------. **(Ans: Reciprocal Equation).**
3. If f(x) = 0 is a polynomial equation and if f(a) & f(b) are different sign, then---------.
(Ans : Atleast one root lies between a & b).
4. If f(x) = 0 has no real root between a & b then f(a) & f(b) are------. **(Ans: Same sign).**
5. In a polynomial with real coefficients, imaginary roots occurs in -------.
(Ans: Conjugate Pairs).
6. Write an iterative formula for Newton's method**.** **(Ans: $\alpha_{r+1} = \alpha_r - f(\alpha_r)/f'(\alpha_r)$).**
7. Every polynomial equation of the n^{th} degree has exactly ---------- roots**.** **(Ans: n).**
8. $f(x) = (x-\alpha_1)\varphi_1(x)$ where $\varphi_1(x)$ is an algebraic equation of ----------degree.
(Ans:(n-1)th).
9. Say True or False: The roots of the given equation are diminished by h, where h = sum of the roots/factor. **(Ans: False).**
10. Say True or False: Reciprocal equation of even degree with unlike signs for its its coefficients, therefore x^2-1 is a factor. **(Ans: True).**
11. If $x^5-5x^4+9x^3+ax^2+bx-1 = 0$ is a reciprocal equation find a,b**.** **(Ans : a = -1, b = 5).**
12. If $\alpha_1, \alpha_2, \ldots, \alpha_n$ be the roots of the equation $a_0x^n + a_1x^{n-1} + \ldots + a_n = 0$ transform the equation whose roots are $-\alpha_1, -\alpha_2, \ldots, -\alpha_n$. **(Ans : $a_0x^n - a_1x^{n-1} + \ldots + (-1)^n a_n = 0$).**
13. If $\alpha_1, \alpha_2, \ldots, \alpha_n$ be the roots of the equation $a_0x^n + a_1x^{n-1} + \ldots + a_n = 0$ transform the equation whose roots are $1/\alpha_1, 1/\alpha_2, \ldots, 1/\alpha_n$**.** **(Ans : $a_0x^n + a_1x^{n-1} + \ldots + a_n = 0$).**
14. If $\alpha_1, \alpha_2, \ldots, \alpha_n$ be the roots of the equation $a_0x^n + a_1x^{n-1} + \ldots + a_n = 0$ transform the equation whose roots are $k\alpha_1, k\alpha_2, \ldots, k\alpha_n$. **(Ans : $a_0x^n + ka_1x^{n-1} + \ldots + k^n a_n = 0$).**
15. Form the quadratic equation one root is $\sqrt{2}$. **(Ans: $x^2-2 = 0$).**
16. Form the quadratic equation one root is 1 + i. **(Ans: $x^2-2x-2 = 0$).**
17. Find the sum of the roots of the equation $x^3+px^2+qx+r=0$**.** **(Ans: -p).**
18. Find the product of the roots of the equation $x^3+px^2+qx+r=0$. **(Ans: -r).**
19. Reciprocal equation of odd degree with unlike signs for its its coefficients, therefore

---------- is a root. **(Ans : 1).**

20. Reciprocal equation of even degree with unlike signs for its its coefficients, therefore ---------- is a root. (**Ans : 1,-1).**

Unit II

21. A matrix A for which $A^{k+1} = A$ is called------- where k is a positive integer.

(Ans: Periodic).

22. A square matrix A is called ---------- if $A^2 = A$. **(Ans: Idempotent).**
23. As the rank of every non zero matrix is greater than or equal to one, to assign the rank----------. **(Ans : Zero).**
24. Rank of a matrix is unaltered by elementary----------. **(Ans : Transformation).**
25. ---------- is the normal form of the unit matrix. **(Ans : Canonical form).**
26. Say True or False : The rank of every n- rowed non singular matrix is n. **(Ans: True).**
27. Say True or False : The rank of A≤r if all minors of order (r+1) are zero.**(Ans: True).**
28. Say True or False : The inverse of a matrix, if it is exists, is zero. **.(Ans: True).**
29. Say True or False : The operation of transposing and inverting are additive.

(Ans: False).

30. Say True or False : The inverse of a matrix of A= adj A/ |A|. **(Ans: True).**
31. A diagonal matrix all of whose diagonal elements are equal, is acalled a ---------.

(Ans: Scalar matrix).

32. If A=$\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ then the order of the matrix A is ----------. **(Ans: 2).**
33. A square matrix A = $[a_{ij}]$ is said to be skew symmetric if --------. **(Ans: $a_{ij} = -a_{ij}$).**
34. If A = $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ then the value of A^T = ----------. **(Ans: $\begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$).**
35. If A = $\begin{bmatrix} 2+i & 1-i \\ 5 & 7 \end{bmatrix}$ then the value of $\bar{A}$= ----------. **(Ans: $\begin{bmatrix} 2-i & 1+i \\ 5 & 7 \end{bmatrix}$).**
36. Say True or False: Every diagonal element of a Hermitian matrix is real **(Ans: True).**
37. Find AB, if A= $\begin{bmatrix} 1 & 1 \\ 2 & 0 \\ 3 & 2 \end{bmatrix}$ B = $\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$ ----------. **(Ans: $\begin{bmatrix} 12 & 14 \\ 10 & 12 \\ 29 & 34 \end{bmatrix}$).**
38. If $r(A) \neq r(A, B)$, then the equations are----------. **(Ans: Inconsistent).**

39. If r(A) = r(A, B)< n, then the equations are----------. **(Ans: Inconsistent).**

40. Find the rank of a matrix $\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 4\\ 0 & 2 & 2\end{bmatrix}$----------. **(Ans: 3).**

Unit III

41._____ is the process of computing intermediate values of a function.

(Ans : Interpolation)

42._____ is used to find the values outside the interval. **(Ans : Extrapolation)**

43. In interpolation , the symbol Δ denotes an operation called _____operator.

(Ans : Forward difference)

44. In interpolation , the symbol ∇ denotes an operation called _____operator.

(Ans : Backward difference)

45.In the difference table, the first differences of y are denoted by __ **(Ans : Δy)**

46. In the difference table, Δ^2 is an operator called ,_____forward difference operator

(Ans : Second order)

47.The first order forward difference Δy_0 = _____ **(Ans :$y_1 - y_0$)**

48.The second order forward difference $\Delta^2 y_0$= _____ **(Ans : $\Delta y_1 - \Delta y_0$)**

49. The third order forward difference $\Delta^3 y_1$= _____ **(Ans : $\Delta^2 y_2 - \Delta^2 y_1$)**

50.y = f(x) is a given function of x, the independent variable x is called _____ and the dependent variable y is called ____ **(Ans : argument , entry)**

51. Gregory Newton's f interpolation formula is used only for_____intervals

(Ans : Equal)

52.In interpolation , we can find the missing values of x using the operator _____and _____ **(Ans : Δ , E)**

53.The value of ∇y_2 = _____ **(Ans : $y_2 - y_1$)**

(Say true or false)

54.The shifting operator E = 1 + Δ **(Ans : True)**

(Say true or false)

55. The operator E^{-1} = 1 - ∇ **(Ans : True)**

56.The values of the independent variable are not equally spaced we will use _____ **(Ans : Lagrange's formula)**

57.The value y_0 is called the leading term and the differences $\Delta y_0, \Delta^2 y_0, \Delta^3 y_0 \ldots$ are called _____ **(Ans : Leading differences)**

58.If y(x) is a polynomial of n^{th} degree $\Delta^{n+1} y_0, \ldots\ldots$ are_____ **(Ans : Zero)**

59.The arguments are x_0 , x_0+h , $x_0+2h, \ldots$,here h is called_____ **(Ans : interval of differencing)**

(Say true or false)

60.The operators Δ , ∇ , E are linear operators **(Ans : True)**

Unit IV

61.The value of sinhx = _____ **(Ans : $\frac{e^x - e^{-x}}{2}$)**

62. The value of coshx = _____ **(Ans : $\frac{e^x + e^{-x}}{2}$)**

63. The value of tanhx = _____ **(Ans : $\frac{e^x - e^{-x}}{e^x + e^{-x}}$)**

64.The value of cot hx = _____ **(Ans : $\frac{e^x + e^{-x}}{e^x - e^{-x}}$)**

65. The value of coshx - sinhx = _____ **(Ans : e^{-x})**

66. The value of coshx + sinhx = _____ **(Ans : e^x)**

67. The value of $\cosh^2 x + \sinh^2 x$ = _____ **(Ans : cosh2x)**

68. The value of $\cosh^2 x - \sinh^2 x$ = _____ **(Ans : 1)**

69. The value of sin(ix) = _____ **(Ans : i sinhx)**

70. The value of cos(ix) = _____ **(Ans : coshx)**

71. The value of tan(ix) = _____ **(Ans : i tanhx)**

72. The value of sinh0 = _____ **(Ans : 0)**

73. The value of cosh0 = _____ **(Ans : 1)**

74. The value of tanh0 = _____ **(Ans : 0)**

75. The value of sinh2x = _____ **(Ans : 2 sinhx coshx)**

76. The value of sinh(-x) = _____ **(Ans : - sinhx)**

77. The value of cosh(-x) = _____ **(Ans : coshx)**

78. The value of $\sinh^{-1}x$ =_____ **(Ans : $\log_e (x + \sqrt{x^2+1})$)**

79. The value of $\cosh^{-1}y$ =_____ **(Ans : $\log (y + \sqrt{y^2-1})$)**

80. The value of $\tanh^{-1}y$ =_____ **(Ans : $\frac{1}{2} log \left(\frac{1+y}{1-y}\right)$)**

Unit V

81.If x = r cos θ and y = r $sin\theta$, then the jacobian value is _____ **(Ans : r)**

82._____is the equation of the conic in general. **(Ans : $\frac{l}{r}$ = 1+ e cos θ)**

83.In the general conic equation, if_____ it is an ellipse **(Ans : e < 1)**

84.In the general conic equation, if e = 1 it is a _____ **(Ans : parabola)**

85.In the general conic equation, if_____ it is an hyperbola **(Ans : e > 1)**

86.In the general conic equation, if e = $\sqrt{2}$ it is a _____

(Ans : rectangular hyperbola)

87.The reciprocal of the curvature of a curve at any point is called the _____of curvature **(Ans : radius)**

88. Find the radius of curvature at x=$\frac{\pi}{2}$ on the curve y=sinx is __ (**Ans** : -1)

89.Curvature of a curve y=f(x) is defined as___ **(Ans : $\frac{d\Psi}{ds}$)**

90. The radius of curvature of a curve y= f(x) is defined as___ **(Ans : $\frac{ds}{d\Psi}$)**

91. The curvature of a circle of diameter d is ___ **(Ans : $\frac{2}{d}$)**

92. The curvature of the curve $x^2 + y^2 = r^2$ is___ **(Ans : $\frac{1}{r}$)**

93. If x + y = u, 2x - 3y = v find J ? **(Ans : $\frac{-1}{5}$)**

94. The curvature of the straight line y = mx+c is ___ **(Ans : 0)**

95. The radius of curvature of the straight line ax+by+c=0 is ___ **(Ans :∞)**

96. If x=r cos θ and y=r sin θ then the value of $\frac{\partial(x,y)}{\partial(r,\theta)}.\frac{\partial(r,\theta)}{\partial(x,y)}$ =___ **(Ans : 1)**

97. The radius of curvature of y = sinx is____ **(Ans : -1)**

98. The radius of curvature of the curve x=2cosθ ,y=2sinθ is___ **(Ans : 2)**

99. The radius of curvature of the curve y=cosx at (0,1) is ___ **(Ans : -1)**

100. The radius of curvature of the curve y=4sinx at x= $\frac{\pi}{2}$ is___ **(Ans : $\frac{-1}{4}$)**

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