

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore - 641043.

Master's Degree Examination – November 2017

Semester I

Class: I PG

Time: 3hrs

Major: Bioinformatics

Max. Marks: 60

17MBIC02 Paper – 2 Applied Mathematics and Scientific Computing in Bioinformatics

Part A

Answer the following

10x1/2 = 5

Circle the correct answer

1. Choose the correct answer

- a. $\det A = \det (A^{-1})$ b. $\det (AB) = (\det A) (\det B)$
c. $\det (A-B) = \det A - \det B$ d. $\det (A+B) = \det A + \det B$

2. What are the dimensions of matrix F? $F = \begin{pmatrix} 2 \\ 3 \\ 6 \end{pmatrix}$

- a. 1x3 b. 3x1 c. 1x1 d. none of the above.

3. If the order of matrix A is $m \times p$ and the order of B is $p \times n$. Then the order of matrix AB is

- a. $m \times n$ b. $n \times m$
c. $n \times p$ d. $m \times p$

4. If any 2 vectors are equal or collinear then their scalar triple product is

- a. 1 b. 0
c. 0 & 1 d. none of the above

5. The composite Simpson's rule is clearly much more accurate than the composite -----rule.

- a. trapezoidal b. Simpson's 1/3 rule
 c. Simpson's 3/8 rule d. none of these

6. You have some quantity Q and some approximation method depending on some parameter h giving a value $A(h)$, then the error order is the largest p such that

- a. $H(A) - Q = O(h^p)$ b. $A(h) - Q = O(h^p)$
 c. Both a & b d. None of these

7. Disadvantages of the Taylor Series Method

- a. One step. explicit b. can be high order
 c. Needs the explicit form of derivatives of f d. global error is the same order as LTE

8. In which of the following method, we approximate the curve of solution by the tangent in each interval

- a. Newton's method b. Euler's method
 c. Taylor's method d. Runge - Kutta method

9. Gaussian elimination is a method for solving matrix equations of the form

- a. $Ax = b$ b. $A(x) = B$
 c. $aX = b$ d. None of these

10. A stationary iterative method is an iterative method for which the update algorithm can be written in the form:

- a. $x^{(k+1)} = B x^{(k)} + c, k=0,1,2,\dots$ b. $x^{(k+1)} = x^{(k)} + c, k=0,1,2,\dots$
 c. $x^{(k+1)} = B x^{(k)} \quad k=0,1,2,\dots$ d. None of these.

Part-B (5 x 4 = 20)

Answer all questions

11 (a) Solve the following

$$x+y+z = -1$$

$$x+2y+3z = -4$$

$$x+3y+4z = -6 \quad (\text{or})$$

11 (b) If $X+Y = \begin{pmatrix} 1 & -1 \\ 3 & 0 \end{pmatrix}$, $X-Y = \begin{pmatrix} 3 & 1 \\ 1 & 4 \end{pmatrix}$ then X is

12 (a) Find the distance between A(4, -3) and the line L: $3x - 4y + 2 = 0$.

(or)

12 (b) Find a, b, c $\vec{i} + \vec{j} + 2\vec{k}$, $-\vec{i} + c\vec{k}$, $2\vec{i} + a\vec{j} + b\vec{k}$ are mutually orthogonal.

13 (a) Evaluate the integral $\int \frac{dx}{1+3 \sin x}$ is

(or)

13 (b) Explain : Newton backward formulae

14 (a) If $U = (x-y)(y-z)(z-x)$ Show that $U_x + U_y + U_z = 0$

(or)

14 (b) write difference between Taylor series and Runge- kuta method

15 (a) Apply Jacobi's method

$$4x_1 - x_2 - x_3 = 3$$

$$-2x_1 + 6x_2 + x_3 = 9$$

$$-x_1 + x_2 + 7x_3 = -6$$

(or)

15 (b) Explain Gauss Jordan method

Part-C (5 x 7 = 35)

16 (a) Find the inverse of the matrix $A = \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$
(or)

16(b) Solve this $2x - y + 3z = 9$, $x + y + z = 6$, $x - y + z = 2$

17 (a) If $a = 2i + 3j - k$, $b = -2i + 5k$, $c = j - 3k$ verify that $a \times (b \times c) = (a \cdot c) b - (a \cdot b) c$

(or)

17 (b) If $D \perp D'$, $D: (2a - 3)x + ay - 2 = 2y + 3a$ and $D': (3a - 1)y + 2(3a + 1)x = a - 1$ find the value of a .

18(a) Evaluate $\int_0^{\pi/2} \text{Log}(\tan x) dx$

(or)

18(b) Explain Trapezoidal and its applications

19 (a) Prove the following by using Euler's theorem: If $u = \tan^{-1} \frac{x^3 + y^3}{x - y}$ prove that $x \frac{\delta u}{\delta x} + y \frac{\delta u}{\delta y} = \sin 2u$.

(or)

19 (b) Solve : $(x^3 + 3xy^2) dx + (y^3 + 3x^2y) dy = 0$.

20 (a) Explain Gauss elimination method with one example

(or)

20 (b) Use Gaussian elimination to solve the system of linear equations $x_1 - 2x_2 - 6x_3 = 12$, $2x_1 + 4x_2 + 12x_3 = -17$, $x_1 - 4x_2 - 12x_3 = 22$.