MATHEMATICS II (MA150)

MCQs (ODE, Laplace Transformation and Linear Algebra)

* Required

1. Email *

2. Upload your response sheets in PDF for with file name as your Enrolment number with in stipulated time. [Max file size is 10 MB.]

   Files submitted:

3. Answer the following question, its about columns of A matrix :- 1 point

which of the following is/are perpendicular to the columns of A, where $A = \begin{bmatrix} -1 & 1 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 \\ 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & -1 & 1 & 0 \end{bmatrix}$

(a) $(1, -1, 1, 0, 0)$

(b) $(1, -1, 0, 1, 1)$

(c) $(0, 0, 2, -2, 2)$

(d) $(-3, 3, -2, -1, 1)$

Mark only one oval.

- a,b,c
- a,c,d
- b,c,d
- a,d

4. 1 point

The determinant of the matrix $\begin{bmatrix} 2022 & 2021 & 2021 & 2021 \\ 2022 & 2022 & 2021 & 2021 \\ 2022 & 2022 & 2022 & 2021 \\ 2022 & 2022 & 2022 & 2022 \end{bmatrix}$

Mark only one oval.

- 2021
- 1
- 2022
- 4043

5. 1 point

Let $M = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ 0 & 1 \end{bmatrix}$ and $x = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$. Then $\lim_{n\to\infty} M^n x$

Mark only one oval.

- does not exist
- (1,2)
- (2,4)
- (3,4)

6. On Projections: 1 point

What is the projection of $b = \begin{bmatrix} 4 \\ 4 \\ 6 \end{bmatrix}$ onto the column space of $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 0 & 1 \end{bmatrix}$.

Mark only one oval.

- (2,4,6)
- (2,2,4)
- (1,3,4)
- (1,1,2)

7. 1 point

Which of the following is/are orthogonal matrices.

$$A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}. C = \begin{bmatrix} -1 & 4 & 2 \\ 4 & -1 & 4 \\ 2 & 4 & -1 \end{bmatrix}, D = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

Mark only one oval.

- A,B
- A,C
- B,C,D
- A,D

8. Eigen values of the Matrix A: 1 point

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

Mark only one oval.

- 0,1,2,1
- 0,0,0,4
- 0,0,2,2
- 0,0,1,3

9. State True or False: 1 point

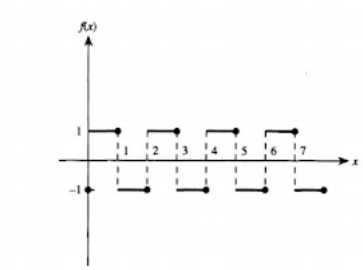
Laplace transform of $x^{\frac{7}{2}}$ is $\frac{105}{16}s^{-\frac{9}{2}}$.

Mark only one oval.

- True
- False

10. 1 point

Laplace transform of $f(x)$ given in the following graph



exists and is equal to $\frac{1}{s}\tanh\frac{s}{2}$.

Mark only one oval.

- True
- False

11. 1 point

Let V be the subspace of $11-$ dimensional vector space R^{11} and $dim(V) = 7$. How many different size(dimensional) of orthogonal subspace for V is/are possible?

Mark only one oval.

- 1
- 2
- 4
- 5

12. What is your Name? *

13. What is your Enrolment number? *

14. The determinant of I+A is 1+det(A) 1 point

Mark only one oval.

- True
- False

15. The volume of a box that has edges (0, 0, 0), (3, 1, 1), (1, 3, 1)and(1, 1, 3). 1 point

Mark only one oval.

- 9
- 15
- 5
- 20

16. (More than one option may be correct. Mark will be awarded only if all the correct options are selected.) Suppose the matrix X has columns which are eigenvectors of A. If the columns are linearly independent, then 1 point

Check all that apply.

- [ ] A is diagonalizable
- [ ] X is diagonalizable
- [ ] A is invertible
- [ ] X is invertible

17. 1 point

$\mathbb{L}^{-1}\left(\frac{1}{s(s^2+4)}\right)$ is $\frac{1}{4} - \cos 2x$.

Mark only one oval.

- True
- False

18. 1 point

$\mathbb{L}^{-1}\left(\frac{s+1}{s^2-9}\right)$ is $\frac{3\cosh 3x+\sinh 3x}{3}$.

Mark only one oval.

- True
- False

19. 1 point

Does $\int_0^x te^t f(x-t)dt$ unique soluton of the initial value ODE $y''-2y'+y=f(x)$ with $y(0)=0, \quad y'(0)=0$.

Mark only one oval.

- True
- False

20. 1 point

If the differential equation $(2x^2 + by^2)dx + cxydy = 0$ is made exact by multiplying the integrating factor $\frac{1}{x^2}$. Then the relation between b and c is

Mark only one oval.

- 2c=b
- c=b
- 2b+c=0
- b+2c=0

21. 1 point

If $y = 3e^{2x} + e^{-2x} - \alpha x$ is the solution of the initial value problem $\frac{d^2y}{dx^2} + \beta y = 4\alpha x,\ y(0) = 4$ and $y'(0) = 1$, where $\alpha,\ \beta\ \in$ **R**. Then

Mark only one oval.

$\alpha = 3, \beta = 4$

Option 1

$\alpha = -3, \beta = 4$

Option 2

$\alpha = 3, \beta = -4$

Option 3

$\alpha = -3, \beta = -4$

Option 4

22. 1 point

The solution of $x \log x \frac{dy}{dx} = y, y(e) = 1$ is

Mark only one oval.

- defined for all x in R
- positive for all x in (1, infinity)
- negative for all x in (1, infinity)
- none

23. 1 point

Let $y_1,\ y_2$ be two solutions of $\frac{d^2y}{dx^2} + y\sin x = 0,\ 0 \le x \le 1$. Let $g(x) = W(y_1, y_2)$ (wronskain of y_1 and y_2). Then

Mark only one oval.

$g'(x) > 0 \forall x \in [0,1]$

Option 1

$g'(x) < 0 \forall x \in [0,1]$

Option 2

$g'(x) = 0 \forall x \in [0,1]$

Option 3

$g'(x) \neq 0 \forall x \in [0,1]$

Option 4

24. 1 point

Let $y_1,\ y_2$ defined on [0,1] be two solutions of $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$. Let $W(x)$ be the wronskain of y_1 and y_2 and satisfying $W\left(\frac{1}{2}\right) = 0$. Then

Mark only one oval.

$W(x) > 0 \forall x \in [0, 1]$

Option 1

$W(x) < 0 \forall x \in [0, 1]$

Option 2

$W(x) = 0 \forall x \in [0, 1]$

Option 3

$W(x) \neq 0 \forall x \in [0, 1]$

Option 4