

Roll No.:.....

# National Institute of Technology, Delhi

Name of the Examination: B.Tech

Mid Semester Examination (Spring, 2023)

Branch : CSE

Semester : 2nd

Title of the Course : Applied Linear Algebra

Course Code : MALB 152

Time: 90 Minutes

Maximum Marks : 25

COURSE OUTCOMES		COGNITIVE LEVELS
<b>CO1</b>	To understand the concept of matrix and will be able to apply this to find the inverse of the matrix and to solve the system of equations.	<b>Understanding</b> (Level II)
<b>CO2</b>	Gain a understanding of the concept of vector space, Linear transformation and will be able to apply this in solving various linear models	<b>Applying</b> (Level III)
<b>CO3</b>	To learn concept of eigen values and eigen vectors and use it to diagonalize the matrix.	<b>Applying</b> (Level III)
<b>CO4</b>	Gain a understanding of concept of Inner product space and its various applications.	<b>Evaluating</b> (Level V)

Course Outcomes (CO's)	CO1	CO2	CO3	CO4
Questions No.	1,2,3,6,7	4,5,8		

**Answer the following questions.**

Note: All sections are compulsory.

## Section A

**Section A contains 03 questions (Question Number 1 to 3) of 01 Mark each.**

**Q1** Find a matrix A such that  $W = \text{Col } A$ .

$$W = \left\{ \begin{bmatrix} 6a - b \\ a + b \\ -7a \end{bmatrix} : a, b \text{ in } \mathbb{R} \right\}$$

**Q2.** How many pivot columns must a  $6 \times 4$  matrix have if its columns are linearly independent ? Why?.

**Q3.** Find the area of the parallelogram whose vertices are  $(0,0), (5,2), (6,4), (11,6)$ .

## Section B.

**Section B Contains 04 theoretical questions (Question no. 4-7) of 04 Marks each.**

**Q4.** Let  $T : \mathbb{R}^4 \rightarrow \mathbb{R}^3$  be a linear transformation whose standard matrix is

$$A = \begin{bmatrix} 1 & -4 & 8 & 1 \\ 0 & 2 & -1 & 3 \\ 0 & 0 & 0 & 5 \end{bmatrix}$$

Is the T one-one , on to or both.

Q5. Find a basis for the space spanned by the vectors  $\begin{bmatrix} 1 \\ 0 \\ -2 \\ 3 \end{bmatrix}$ ,  $\begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \end{bmatrix}$ ,  $\begin{bmatrix} 2 \\ -2 \\ -8 \\ 0 \end{bmatrix}$ ,  $\begin{bmatrix} 2 \\ -1 \\ 10 \\ 3 \end{bmatrix}$  and  $\begin{bmatrix} 3 \\ -1 \\ -6 \\ 9 \end{bmatrix}$ .

Q6. Find the non singular matrices P and Q so that PAQ is in normal form where

$A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$ . Also find the rank of A.

Q7. Find the inverse of a matrix  $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & 3 \\ 4 & -3 & 8 \end{bmatrix}$ , if it exists.

### Section C

**Section C contains 01 theoretical question (Question No. 8) of 06 Marks.**

Q 8. Find a basis and the dimension of Row space, Column space and null space of the matrix

$$\begin{bmatrix} -2 & 4 & -2 & -4 \\ 2 & -6 & -3 & 1 \\ -3 & 8 & 2 & -3 \end{bmatrix}$$



**National Institute of Technology, Delhi**  
**Name of the Examination: Mid-Semester Examination (2023)**

**Branch: Computer Science Engineering**  
**Title of the Course: System Programming**  
**Time: 1 Hour 30 mins**

**Semester: IInd**  
**Course Code: CSLB 153**  
**Maximum Marks: 25**

Question Paper mapping with CO

Q.No.	1	2	3	4	5	6
Marks	6	4	4	4	4	3
CO	CO 2	CO 1	CO 1	CO 1	CO 2	CO 2

Q: 1 Describe and explain the following:

- a) data structures used for the pass 1 of an assembler. 3
- b) Operation performed in pass 2 in Macro Processors 3

Q: 2 Differentiate and explain with the examples of assembly language code.

- a) Pseudo operations and machine operations
  - b) CLR instruction and CR instruction 2
- 2

Q: 3 Differentiate and explain with the examples of assembly language code.

- a) INDEX EQU 5 and INDEX DC F'5' 2
- b) movq with registers and memory 2

Q: 4 Discuss and justify the contents of the register 3 after each instruction in the following sequence? (assuming only the register 3 is involve din the execution of the program)

LA            3,=A(XYZ)  
LR            3,3  
L             3,=F '5'

LCR 3,3

LNR 3,3

4

Q: 5 Discuss and illustrate mini flowcharts for the instructions

a) A (Add , RX form)

2

b) BXLE (Branch on Index Less Than or Equal, RS form)

2

Q: 6 Macro expansion and the subroutine calls are similar during the program execution.

Explain what are the similarities and differences between them and how the stack

frame handled during subroutine calls?

3

#### Course Matrix (CO-PO-PSO Mapping)

COs	POs													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	--	--	--	--	--	--	--	--	--	2	1
CO2	3	3	3	--	--	--	--	--	--	--	--	--	2	1

1=Addressed to small extent

2= Addressed significantly

3= Addressed strongly (major part of course)

Roll No.: .....



National Institute of Technology, Delhi  
Name of the Examination: MID Semester (Theory)  
Spring Examination (2023)

Branch: Computer Science and Engineering

Semester: B Tech (1<sup>st</sup> year II<sup>nd</sup> Sem)

Title of the Course: Discrete Structure

Time: 1 Hour 30 Minutes

Course Code: CSLB 152

Maximum Marks: 25

Q. No.	1	2	3	4	5
Marks	3	2	2	9	9
CO	2	2	2	2	2
PO	1	1	2	3	3

**Note: All questions are compulsory.**

- Q1.** Write the following compound propositions using logical connectives and propositional variables  $p, q$  and  $r$  if: **<Marks 3> <CO2>**  
 $p$ : The user has entered valid password.  
 $q$ : Access is granted.  
 $r$ : The user has paid the subscription fee.
1. The user has paid the subscription fee but does not enter a valid password.
  2. Access is granted whenever the user has paid the subscription fee and enters a valid password.
  3. If the user has not entered a valid password but has paid the subscription fee then access is granted.
- Q2.** Find whether the given compound propositional statements are logically equivalent without using the truth table. **<Marks 2> <CO2>**
1.  $(p \rightarrow r) \wedge (q \rightarrow r)$  and  $(p \vee q) \rightarrow r$
  2.  $(p \rightarrow q) \rightarrow r$  and  $p \rightarrow (q \rightarrow r)$
- Q3.** Express the statement: The collector has exactly one stamp issued by each African Country in the form of predicate statements. **<Marks 2> <CO2>**
- Q4.** Prove that the argument form is valid for given premise using the rules of inferences. **<Marks 3 + 3 + 3=9> <CO2>**
- A. Use rules of inferences.**
- Premise:**
- ❖ Randy works hard.
  - ❖ If Randy works then he is a dull boy.
  - ❖ If Randy is dull boy then he will not get the job.
- Conclusion:** Randy will not get job.

**B. Use only Resolution-Refutation property.**

**Premise:**

- ❖ It is not raining or Yvo has his umbrella.
- ❖ Yvo does not have his umbrella or he does not get wet.
- ❖ It is raining or Yvo does not get wet.

**Conclusion:** Yvo does not get wet.

**C. Use rules of inferences by considering the arbitrary domain for all students.**

**Premise:**

- ❖ Some Students enrolled in Discrete Mathematics left the campus for the weekend.
- ❖ All seniors left the campus for the weekend.

**Conclusion:** Some seniors enrolled in Discrete Mathematics

**Q5.** Prove the following statements by properly stating the name of proving technique with translating these statements into predicate statements.

**<Marks 4 + 5 = 9 >**  
**<CO2>**

- A. There are infinitely many primes.  
B. If  $7|4a$  (7 divides  $4a$ ), then also  $7|a$ .

**Course Matrix (CO-PO-PSO Mapping)**

COs	POs													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	2	1	1	3	-	-	2	-	1	1	2	2	1	2
C02	3	3	2	3	-	3	1	1	2	3	3	3	3	3
C03	1	3	2	-	2	1	-	-	1	-	1	1	3	1
C04	2	2	1	1	-	2	3	-	3	1	2	2	2	2

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- b) Illustrate with examples the advantages of Array over Linked List? 2
6. a) Define hashing and discuss the need for Hashing 2
- b) Define collision in hashing. 1
- c) Explain the working of Double Hashing in case of collision 2

Course Matrix (CO-PO-PSO Mapping)

COs	POs													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	--	--	--	--	--	--	--	--	--	--	3	--
CO2	3	3	2	--	--	--	--	--	--	--	--	--	3	--

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Roll No: 

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**NATIONAL INSTITUTE OF TECHNOLOGY DELHI**

Department of Civil Engineering  
**MID SEMESTER EXAMINATION**

**B. Tech (I<sup>st</sup> Year): Semester-I (2023)**

**Course Name: Mathematics for Engineers - I**

**Instructor: Dr. Gyanendra Sheoran**

**Time: 1.5 hours**

**Course Code: MALB159 Course**

**Date: 11/05/2023**

**Max. Marks: 25**

**Instruction:**

1. All questions are compulsory.
2. Assume any suitable data, if necessary.
3. [CO- Course Outcome; BL- Bloom's Level]

<b>PART-A</b>		<b>CO</b>	<b>BL</b>	<b>Marks</b>
Q1. a)	Define skew-symmetric matrix.	1	I	1
b)	State two properties of eigen values.	1	II	1
c)	Find the matrix corresponding to the following Quadratic form: $8x^2 + y^2 + 6z^2$	1	III	1
d)	If $\text{rank}(A) = 2$ and $\text{rank}(B) = 3$ , then find the $\text{rank}(AB)$ .	1	IV	1
e)	A matrix has a value and a determinant cannot have a value. (True/ false; with reason)	1	V	1
f)	Two functions u and v are functionally dependent if their Jacobian is .....	2	I	1
g)	Discuss the continuity of the function $f(x, y) = \begin{cases} \frac{2xy}{x^2 + y^2}, & (x, y) \neq 0, 0 \\ 0, & (x, y) = 0, 0 \end{cases}$	2	II	1
h)	Demonstrate $f(x) = 2\sin 3x + 3\cos 3x$ is maxima/minima/neither maxima nor minima at $x = 5\pi/6$ .	2	III	1
i)	If $y = x^x$ , what is $dy/dx$ at $x=1$ ?	2	IV	1
j)	Evaluate $\lim_{\substack{x \rightarrow 1 \\ y \rightarrow 2}} \frac{2x^2y}{x^2 + y^2 + 1}$	2	V	1
<b>PART-B</b>		<b>CO</b>	<b>BL</b>	<b>Marks</b>
Q2.	Evaluate the modal matrix P for $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ and hence diagonalize $A^3$ .	1	V	5
Q3. a)	Find the eigen values and eigen vectors of the matrix A and it's inverse where $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{bmatrix}$	1	IV	3
b)	If $x = e^x \sec \theta$ , $y = e^x \tan \theta$ ; then evaluate $\frac{\partial(x,y)}{\partial(r,\theta)} \cdot \frac{\partial(r,\theta)}{\partial(x,y)}$	2	V	2
Q4. a)	Find three positive numbers whose sum is 100 and whose product is maximum.	2	IV	3
b)	Show that the rectangular solid of maximum volume that can be inscribed in a cube.	2	III	2