Tribhuvan University Institute of Science and Technology 2075

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Bachelor Level / First Year /Second Semester/Science Computer Science and Information Technology (MTH. 163) (Mathematics II)

Full Marks: 80 Pass Marks: 32 Time: 3 hours.

(NEW COURSE)

CSc.163-2075

Candidates are required to give their answers in their own words as for as practicable. The figures in the margin indicate full marks.

Group A

Attempt any three questions:

(3×10-30)

When a system of linear equation is consistent and inconsistent? Give an example for each. Test the consistency and solve: x + y + z = 4, x + 2y + 2z = 2, 2x + 2y + z = 5. (2+1+7)

What is the condition of a matrix to have an inverse? Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 2 & -1 \\ -1 & 5 & 6 \\ 5 & -4 & 8 \end{pmatrix} \text{ in exists.}$$

$$(2+8)$$

3. Define linearly independent set of vectors with an example. Show that the vectors (1, -4, 3)/(0, 3, 1) and (3, -5, 4) are linearly independent. Do they form a basis? Justify.

(2+5+3)

4. Find the least-square solution of
$$Ax = b$$
 for $A = \begin{pmatrix} 1 & 3 & 5 \\ 1 & 1 & 0 \\ 1 & 1 & 2 \\ 1 & 3 & 3 \end{pmatrix}$ and $b = \begin{pmatrix} 3 \\ 5 \\ 7 \\ 3 \end{pmatrix}$. (10)

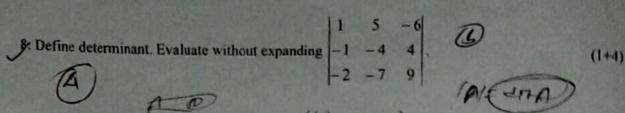
Attempt any ten questions:

 $(10 \times 5 = 50)$

5. Change into reduce echelon form of the matrix
$$\begin{pmatrix} 0 & 3 & -6 \\ 3 & -7 & 8 \\ 3 & -9 & 12 \end{pmatrix}$$
. (5)

♦ 6. Define linear transformation with an example. Is a transformation T: $\mathbb{R}^2 \to \mathbb{R}^3$ defined by T(x, y) = (3x + y, 5x + 7y, x + 3y) linear? Justify. (2+ (2+3)

7. Let
$$A = \begin{pmatrix} -1 & -2 \\ 5 & 9 \end{pmatrix}$$
 and $B = \begin{pmatrix} 9 & 2 \\ k & -1 \end{pmatrix}$. What value (s) of k if any will make AB = BA? (5)



9. Define subspace of a vector space. Let $H = \begin{Bmatrix} s \\ t \\ 0 \end{Bmatrix}$. Show that H is a subspace of \mathbb{R}^3 .

70. Find the dimension of the null space and column space of $A = \begin{pmatrix} -3 & 6 & -1 & 1 & -7 \\ 1 & -2 & 2 & 3 & -1 \\ 2 & -4 & 5 & 8 & -4 \end{pmatrix}$. (5)

2) 12. Find LU factorization of the matrix $\begin{pmatrix} 2 & 5 \\ 6 & -7 \end{pmatrix}$. (2)

13. Define group. Show that the set of all integers Z forms group under addition operation. (1+4)

14. Define ring with an example. Compute the product in the given ring (-3, 5) (2, -4) in $\mathbb{Z}_4 \times \mathbb{Z}_{11}$.

(2.5+2.5)

15. State and prove the Pythagorean theorem of two vectors and verify this for u = (1, -1) and v = (1, 1).

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