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**Course: MAT 204**

**Department: Computer science 200level**

Let A = 3 0 1 B = 4 9 3 C = 8 9 1

 4 6 5 0 6 2 0 2 0

 7 1 1 6 1 2 1 4 3

**Question 1**

Linear Transformation of A

Vector X = a

 b

 c

T(X) = AX

T(X) = 3 0 1 a

 4 6 5 b

 7 1 1 c

T(X) = a 3 + b 0 + c 1

 4 6 5

 7 1 1

T(X) = 3a + 0b + c

 4a 6b 5c

 7a b c

T(X) = 3a + 0b + c

 4a + 6b + 5c

 7a + b + c

Hence, transformation of a gives 3a + 0b + c

 b 4a + 6b + 5c

 c 7a + b + c

**Question 2**

Rank of (B+C) transpose

(B+C) = 4 9 3 **+** 8 9 1

 0 6 2 0 2 0

 6 1 2 1 4 3

(B+C) = 12 18 4

 0 8 2

 7 5 5

(B+C)T = 12 0 7

 18 8 5

 4 2 5

/(B+C)T/ = 12 0 7

 18 8 5

 4 2 5

/(B+C)T/ = 12 8 5 - 0 18 5 + 7 18 8

 2 5 4 5 4 2

/(B+C)T/ = 12[40 – 10] – 0[90 – 20] + 7[36 -32]

/(B+C)T/ = 360 – 0 +28

/(B+C)T/ = 388

**Since /(B+C)T/ ≠ 0, the rank of the matrix is 3**

**Question 3**

Check if matrices A, B, C are singular or non-singular

1. /A/ = 3 0 1

 4 6 5

 7 1 1

/A/ = 3 6 5 - 0 4 5 + 1 4 6

 1 1 7 1 7 1

/A/ = 3[6 – 5] – 0[4 – 35] + 1[4 – 42]

/A/ = 3 – 0 – 38

/A/ = -35

**/A/ ≠ 0, therefore, Matrix A is a non-singular matrix**

1. /B/ = 4 9 3

 0 6 2

 6 1 2

/B/ = 4 6 2 -9 0 2 +3 0 6

 1 2 6 2 6 1

/B/ = 4[12 – 2] – 9[0 – 12] + 3[0 – 36]

/B/ = 40 + 108 – 108

/B/ = 4

**/B/ ≠ 0, therefore, Matrix B is a non-singular matrix**

1. /C/ = 8 9 1

 0 2 0

 1 4 3

/C/ = 8 2 0 - 9 0 0 + 1 0 2

 4 3 1 3 1 4

/C/ = 8[6 – 0] – 9[0 – 0] + 1[0 – 2]

/C/ = 48 – 0 – 2

/C/ = 46

**/C/ ≠ 0, therefore, the Matrix C is a non-singular matrix**