MTH100 Monsoon Semester – 2016-17 **Section A**

Submission for Tuesday 16th August 2016. Time: 15 minutes. Max Marks: 5

Given the matrix A below.

$$A = \begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ 1 & 2 & -6 & 7 \end{bmatrix}$$

1) Find the RREF matrix of A. *(3 marks)*

2) Suppose that this the coefficient matrix of the homogeneous system $A\mathbf{x} = \mathbf{0}$. What can you say about the solution of the system ?

a. No solutions (inconsistent system).
b. Unique solution.
c. Infinitely many solutions.

Select exactly one of a. or b. or c. as your answer and justify it briefly (maximum one sentence). *(2 marks)*

SOLUTION

Q1. $R = \begin{bmatrix} 1 & 2 & 0 & \frac{17}{5} \\ 0 & 0 & 1 & -\frac{3}{5} \\ 0 & 0 & 0 & 0 \end{bmatrix}$

Q2. (C) Infinitely many solutions

Following are acceptable reasons:

(i) Since R has free variables, ~~these~~ which can be treated as parameters, there are infinitely many.

(ii) If A is an $m \times n$ - matrix with $m < n$, then the system $A\bar{x} = \bar{0}$ must have infinitely many solutions (Observation 3 for Homogeneous Systems)

(iii) Solution of system is : $\bar{x} = x_2 \begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} -17/5 \\ 0 \\ 3/5 \\ 1 \end{bmatrix}$

MTH100 Monsoon Semester – 2016-17 **Section B**

Submission for Thursday 18th August 2016. Time: 15 minutes. Max Marks: 5

Given the matrix C below.

$$C = \begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ 1 & 2 & -6 & 7 \end{bmatrix}$$

1) Find the RREF matrix of C. *(3 marks)*

2) Suppose that C is actually the augmented matrix of a non-homogeneous system $Ax = b$, i.e. $C = [A:b]$. What can you say about the solution of the system ?

a. No solutions (inconsistent system).
b. Unique solution.
c. Infinitely many solutions.

Select exactly one of a. or b. or c. as your answer and justify it briefly (maximum one sentence). *(2 marks)*

SOLUTION

Q 1. $R = \begin{bmatrix} 1 & 2 & 0 & \frac{17}{5} \\ 0 & 0 & 1 & -3/5 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

Q 2. c. Infinitely many solutions

Any of the following is acceptable :-

Reason : (i) Since the system ~~has a~~ is consistent and has a free variable (namely x_2) which can be treated as a parameter, there are infinitely many solutions

(ii) Since the system is consistent, and the associated homogeneous system has infinitely many solutions.

(iii) Solution is $\bar{x} = \begin{bmatrix} 17/5 \\ 0 \\ \frac{-3}{5} \end{bmatrix} + x_2 \begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix}$