Assignment 1
Subject: Mathematics
3rd Semester (MAJOR) (arrear)
Paper: 3.2 (Linear Algebra and Vector)

Full Marks: 25

**Instruction:** After completing your assignment, save it as pdf and name it as "NAME_RollNo_arrear_3.2" and then mail it to mathematics.adp.2021@gmail.com Here, type your name and roll no in the place of NAME and RollNo while naming the file.

1. **State True or False with justification.** **2.5 x 4 = 10**

   a. The set of vectors {(0,1) ; (-1,0) ; (-1,1)} is linearly independent.

   b. There exists a linear transformation T : $\mathbf{R}^2 \rightarrow \mathbf{R}^2$ such that rank of T is equal to nullity of T (i.e. $\rho(T) = \eta(T)$ ).

   c. $J_n$ be a matrix of order (n x n) whose all the entries are 1. Then the eigenvalues of $J_n$ are 1 and 0; where 0 has the multiplicity (n-1).

   d. If **a**, **b** and **c** are three vectors lying on the same plane, then the scalar triple product of **a**, **b** and **c** is 0.

2. **Answer the following:** **5 x 3 = 15**

   a. Using Cayley-Hamilton Theorem, find $A^4$ and $A^{-1}$, where A is given below:

$$\begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$$

   b. State and Prove Green's Theorem.

   c. State and Prove Gauss' Theorem.