B. Sc. 2nd Semester (G.E.), Internal Exam, 2022-23

Subject: Mathematics Course Title: Algebra.

F. M = 10 marks. Time: 30 min.

Answer any two questions: $5 \times 2 = 10$

(1) If z be a complex number and $\frac{z+1}{z-i}$ be purely imaginary, then show that z lies on the circle whose centre is at $\frac{1}{2}(-1+i)$ and the radius is $\frac{1}{\sqrt{2}}$.

(2) State the principle of Mathematical Induction and using it to show that $(5^n - 1)$ is divisible by 4 for all positive integers n.

(3) Find the Echelon form of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 4 & 6 & 8 \end{bmatrix}$ and hence find the rank of A.

(4) If $T : \mathbb{R}^2 \to \mathbb{R}^2$ be such that $T(a, b) = (a, 0)$ then show that T is a linear transformation.