Department of Mathematics
National Institute of Technology, Srinagar

B. Tech.	Subject	Examination	Session	Time Allowed	Max. Marks
2nd Semester	Mathematics	Mid-Term	Spring 2018	1 1/2 Hours	30

Note: Attempt all the questions.

Q1. (i) Reduce the quadratic form $6x_1^2+3x_2^2+3x_3^2-4x_1x_2-2x_2x_3+4x_3x_1$ to the sum of squares and find the corresponding linear transformation. Also find the index and signature.

(ii) Let A= $\begin{matrix}1 & 2 & -3\\ 0 & 3 & 2\\ 0 & 0 & -2\end{matrix}$. Find the eigen values of $3A^3+5A^2-6A+2I$.

(5, 5)

Q2. (i) Find the rank of the matrix $\begin{bmatrix}1 & 4 & 3 & -2 & 1\\ -2 & -3 & -1 & 4 & 3\\ -1 & 6 & 7 & 2 & 9\\ -3 & 3 & 6 & 6 & 12\end{bmatrix}$ by reducing it to normal form.

(ii) Find the inverse of the matrix $\begin{bmatrix}-1 & -3 & 3 & -1\\ 1 & 1 & -1 & 0\\ 2 & -5 & 2 & -3\\ -1 & 1 & 0 & 1\end{bmatrix}$ by elementary row operations.

(5, 5)

Q3. (i) Find the Fourier series expansion of the function $f(x)$ defined as

$$f(x)=\begin{cases}-\frac{1}{2}+x, & -\frac{1}{2}<x\le 0\\ \frac{1}{2}+x, & 0<x<\frac{1}{2}.\end{cases}$$

(5,5)

(ii) Obtain a Fourier expansion of $f(x)=\pi-|x|, -\pi<x<\pi$.