1. (20 points) Solve the following Second-order differential equation and discuss damping conditions

$$my'' + cy' + ky = 0$$

2. (7 points) (a) Solve the following system by the Gauss elimination

$$\begin{cases} -5x_1 + 2x_2 = 5 \\ 2x_1 - 2x_2 = 16 \end{cases}$$

(10 points) (b) Find the eigenvalues and eigenvectors of the following matrix

$$\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$$

(8 points) (c) What is the relationship between the solution (x_1, x_2) of (a) and the eigenvectors of (b)

3. (10 points) (a) Find the mean and standard deviation of examination scores : 96, 65, 87, 90, 84, 78, 91, 82, 76, 69.

(10points) (b) Find the probability of obtaining at least three "four" in rolling a fair die 4 times

4. (20 points) For a half-wave rectification of Cos wt, find its Laplace transform and Fourier series representation.

5. (15 points) Evaluate the integral $I = \int_c (3x^2 dx + 2yz\, dy + y^2 dz)$ from A:(0, 1, 2) to B:(1, -1, 7).