1.A.	Explain the random process concept with example.
1.B.	Draw A fair coin is tossed. If heads come up, a sine wave $x_1(t) = sin(5\pi t)$ is sent. If tails come up, then a ram $x_2(t) = t$ is sent. The resulting random process x(t) is an ensemble of two realizations, a sine wave, and a ramp signal. Describe and draw the ensemble. The sample space S is discrete.
1.C.	Explain the continuous random sequence.
1.D.	Find the X (ω), where x(t) = sin(ωot)
1.E.	Write the difference between autocorrelation and cross-correlation.
1.F.	Define the mean value of the system response with mathematical expression.
2.	Answer All Question
2.A.	Examine Examine whether the random process $x(t) = Acos(\omega_o t + \theta)$ is a wide sense stationary if A and ω_o are constants and θ is uniformly distributed random variable in $(0, 2\pi)$
2.B.	Show that Consider the discrete-time random process $\{X(n), n \in \mathbb{Z} \cdots\}$, in which the $X(n)$'s are i.i.d. with CDF $F_{X(n)}(x) = F(x)$. Show that this is a (strict-sense) stationary process.
2.C.	Explain the properties of the Power Density Spectrum.
2.D.	Derive the mean square value of system response Y(t).

3.A.	Explain the Gaussian Random Process with mathematical expression.
3.B.	Show that Consider the random process $\{X(t), t \in \mathbb{R}\}$ defined as $$X(t) = \cos(t + U),$$ where $U \sim Uniform(0, 2\pi)$. Show that $X(t)$ is a WSS process.
4.	Answer All Question
4.A.	Define the time average of a random process and time autocorrelation function with mathematical expression.
4.B.	Show That Consider a random process $X(t)$ and its derivative, $X'(t) = \frac{d}{dt}X(t)$. Assuming that the derivatives are well-defined, show that $$R_{XX'}(t_1, t_2) = \frac{\partial}{\partial t_2} R_X(t_1, t_2).$$

5.A.	Explain the significance of spectral characteristics in signal processing, system analysis, and predictive modelling.
5.B.	Find the Value Let $X(t)$ be a continuous-time WSS process with mean $\mu_X = 1$ and $$R_X(\tau) = \begin{cases} 3 - \lvert\tau\rvert & -2 \le \tau \le 2 \\ 1 & \text{otherwise} \end{cases}$$ a. Find the expected power in $X(t)$. b. Find $E\left[\left(X(1) + X(2) + X(3)\right)^2\right]$.

6.A.	Summarize the key concepts of random signal response in linear systems.
6.B.	Find The Value Let $X(t)$ be a white Gaussian noise with $S_X(f) = \frac{N_0}{2}$. Assume that $X(t)$ is input to an LTI system with $$h(t) = e^{-t}u(t).$$ Let $Y(t)$ be the output. a. Find $S_Y(f)$. b. Find $R_Y(\tau)$. c. Find $E[Y(t)^2]$.