

Indian Institute of Space Science and Technology  
AVD623 - Assignment 1  
Department of Avionics

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**Assignment 1**

**Question 1:** A digital source produces a sequence of bits  $(B_0, B_1, \dots)$  according to an independently and identically distributed Bernoulli process, with  $\Pr B_i = 1 = p$ . The bit stream is communicated over a digital channel which flips a 1 transmitted by the source to a 0 with probability 0.3 and a 0 transmitted by the source to a 1 with probability 0.5. Find the average probability of error.

**Question 2:** Suppose  $x(t)$  is a periodic signal with period  $T$ , and the signal in each period is defined as:

$$x(t) = \begin{cases} 1, & \text{for } 0 \leq t \leq \tau \\ 0, & \text{for } \tau < t < T. \end{cases}$$

Obtain the Fourier series representation of  $x(t)$ . If  $y(t)$  is  $x(t)$  for  $0 \leq t < T$  and 0 otherwise, then obtain the Fourier transform representation of  $y(t)$ .

**Question 3:** (a) Discuss/Derive the Parseval's relation for periodic finite power signals. (b) Discuss/Derive the relationships between the input power spectral density and output power spectral density of a LTI system when the input is a wide sense stationary random process.