Assignment-9

K Vivek Kumar - CS21BTECH11026

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Problem 15-7

Show that the sums $s_n = x_1 + x_2 + ... + x_n$ of independent zero mean random variables form a martingale.

Solution : I

Given,

$$s_n = x_1 + x_2 + ... + x_n \tag{1}$$

where, x_n are i.i.d. random variables. We have

$$s_{n+1} = s_n + x_{n+1} \tag{2}$$

Solution : II

So that,

$$E\{s_{n+1}|s_n\} = E\{s_n + x_{n+1}|s_n\} \tag{3}$$
$$= s_n + E\{x_{n+1}\} \tag{4}$$
$$= s_n \tag{5}$$

Hence, $\{s_n\}$ represents a Martingale.