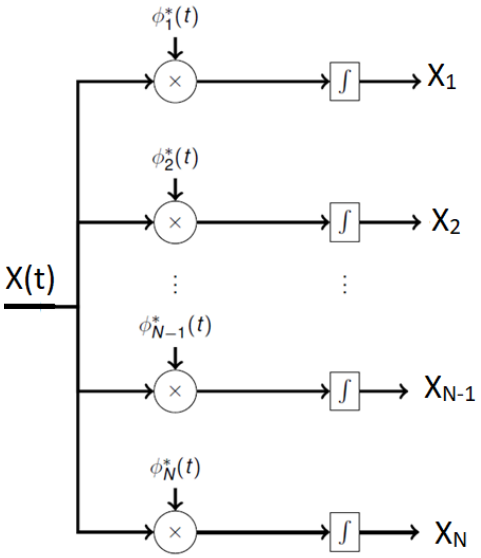
Thapar Institute of Engineering & Technology, Patiala

Department of Electronics and Communication Engineering

UEC639 – Digital Communication

B. E. (Third Year): Semester-VI (ECE)

Tutorial-7

Q1	Consider a random process X(t) given as input to the bank of correlators. $X(t) = s_i(t) + W(t) \quad 0 \le t \le T \quad i = 1,2,...,M$ The sample function of received random random process X(t) is defined as $x(t) = s_i(t) + w(t) \quad 0 \le t \le T \quad i = 1,2,...,M$ $s_i(t)$ --- Signal from transmitter $W(t)$-- White Gaussian Noise process of *zero mean* and power spectral density $N_0/2$ $w(t)$-- Sample function of $W(t)$ Determine the response of bank of Correlators to this random process X(t) Derive the mean and variance of output. 
Q2	Derive the expression of likelihood function for AWGN channel.
Q3	Starting from MAP rule and by deriving the ML rule, determine the block diagram representation of vector receiver.
Q4	Draw the block diagram representation of correlator receiver, including both detector and vector receiver diagrams. Also, explain its limitation.
Q5	Let X be a continuous random variable with the following PDF: $f_X(x) = \begin{cases} 2x & for\ 0 \le x \le 1 \\ 0 & otherwise \end{cases}$ Also, suppose that $P_{Y/X}(y/x) = Geometric(x) = x\,(1-x)^{y-1} \quad for\ y = 1, 2, \ldots.$ *Find the MAP estimate of X given Y = 3;*