Time: 3 Hours **Marks 80**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume Suitable data, if required and state it clearly.

1		Attempt any FOUR	[20]
	a	Calculate the average power of 20cos100t	5
	b	Describe RLC circuit by differential equation	5
	c	Explain the conditions for the existence of Fourier transform	5
	d	Determine the relationship between CTFT and LT	5
	e	Find the z-transform of $x(n) = a^n u(n)$ and sketch the RoC	5
2	a	$x(t) = 2, 0 \le t \le 5$ $= 0$, elsewhere Sketch x(t), x(-t), -x(t), x(t-2), x(t+3), 2x(t), x(2t), x(t/2), x(t) + x(-t) and x(t) – x(t-2)	[10]
	b	Find x[n] using partial fraction method from $X(z) = 3 + 2z^{-1} + z^{-2} / 1 – 3z^{-1} + 2z^{-2}$	[10]
3	a	For a LTI system, input x(t) and impulse response h(t) are given below. Find the output using convolution. $x(t) = h(t) = A, -T \le t \le T$ $= 0$, elsewhere	[10]
	b	Realize the given IIR system using canonic structure. y[n] = -3y[n-1] + 3y[n-2] + y[n-3] + x[n] + 3x[n-1] + 2x[n-2]	[10]
4	a	State and prove sampling theorem for low pass signal using Fourier transform	[10]
	b	Find the autocorrelation function and average power of a periodic signal $A\cos\omega_0 t$	[10]
5	a	Find the Laplace transform of $x(t) = e^{at}$ where a > 0 and sketch the RoC.	[10]
	b	Find the transfer function H(z) and impulse response h[n] of a discrete time system with I/O relation y[n] – o.5y[n-1] = x[n] + 2x[n-1]	[10]

6 a x[n] = [2, -1, 3, 1]. Sketch x[n], x[n+2], x[n-2], x[-n], x[-n +2], x[-n-2], x[2n], x[n/2], -x[-n] and x[n-2] + x[n+1]. Underline in x[n] shows the oth position. [10]

b State and prove modulation theorem using Fourier transform [10]
