T.E. Electronics & Telecommunication
Sem V / Rev
Signals & Systems.

Con. 3724-10.

(REVISED COURSE)

AN–4288

(3 Hours)

[Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory.**
(2) Attempt **five** questions in **all.**
(3) **All** parts of the **same** questions must be written in **continuation.**
(4) Assume suitable **data**, if **required** and state them **clearly.**

1. Answer any **four** of the following :— **20**

(a) Find the ROC of the given signal
$x(t) = 3e^{-2t}\, u(t) - 2e^{-t}\, u(t)$.

(b) Determine the direct form - I realisation for the following transfer function
$H(z) = 1 - 0{\cdot}7\, z^{-1} + 0{\cdot}4\, z^{-2}$

(c) A linear-time invariant (LTI) system is characterized by the following difference equation :
$y(n) = a\, y(n-1) + b\, x(n)$ for $0 < a < 1$
Find the magnitude and phase of the frequency response $H(e^{jw})$ of the system.

(d) Determine the signal energy and signal power for the following signals :
(i) $x(t) = e^{-3|t|}$
(ii) $x(t) = e^{-3t}$

(e) State and explain convolution property of Z-transform.

2. (a) Consider the analog signal $x_a(t) = 5 \sin 200\pi t$ **10**
(i) Determine the minimum required sampling rate to avoid sampling.

(ii) Suppose that the signal is sampled at the rate $F_s = 100$ Hz. What is the discrete time signal obtained after sampling ?

(iii) Suppose that the signal is sampled at the rate $F_s = 300$ Hz, what is the discrete time signal obtained after sampling .

(b) Impulse response of a discrete-time LTI system is expressed as under : **10**
$h(n) = \{1, 2, 3\}$
Find the i/p sequence x(n) for output response which is given by —
$y(n) = \{1, 1, 2, -1, 3\}$.

3. (a) Compute the response of the system $y(n) = 0{\cdot}7\, y(n-1) - 0{\cdot}12\, y(n-2) + x(n-1) + x(n-2)$ to input $x(n) = nu(n)$.
Is the system stable ? **10**

(b) Obtain the Fourier transform of a rectangular pulse of duration 2 seconds and having a magnitude of 10 volts. **10**

4. (a) Find the Fourier series for the function x(t) defined by **10**

$$x(t) = \begin{cases} 0 & \frac{-T}{2} < t < 0 \\ A \sin w_0 t & 0 < t < \frac{T}{2} \end{cases}$$

and $x(t + T) = x(t)$, $w_0 = \frac{2\pi}{T}$.

[TURN OVER