

**S.V. NATIONAL INSTITUTE OF TECHNOLOGY, SURAT-395007**  
**ELECTRONICS ENGINEERING DEPARTMENT**  
**B.Tech II (3<sup>rd</sup> SEMESTER), MID-SEM. EXAM (SEP. - 2012)**  
**SUB: Signals and Systems (DIV A & B)**

**Maximum Marks: 30**

**Times: 1:00 hours**

- Note:** 1) Attempt all questions.  
 2) Assume suitable data if necessary.  
 3) Figure to right indicate marks.

**Q1] Do as directed:**

I) Determine the values of power and energy Signal. Also state whether it is a power or energy signal? [2M]

- a)  $x(n) = (\frac{1}{3})^n u(n)$   
 b)  $x(n) = \sin(\pi/4 n)$

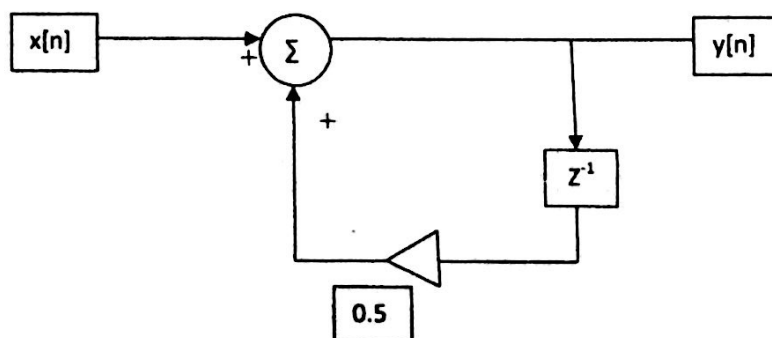
II) Define the term cross-correlation. Also Prove that  $R_{1,2}(\tau) = R_{2,1}^*(\tau)$ . [2M]

III) If  $x(n) = \{4, -2, 4, -6\}$ . Find and sketch it's odd and even part. [1M]

**Q2] Do as directed:**

i) consider the system shown in fig.a

[4M]



Find its response if  $x[n] = 3(0.5)^n$ . If the Initial condition is  $y[-1] = 2$ .

**OR**

Define Convolution. State its basic four steps to solve convolution. Also determine the convolution sum of these two sequences using graphical method.

$x(n) = \{1, 2, 1, 1\}$

$h(n) = \{1, -1, 1, -1\}$

II) A RADAR system need to scan the enemy. The RADAR sends the signal and received the reflected wave .which analysis method can be used to sense the enemy from the received signal. [1M]

Q3] Do as directed:

A] 1) State the importance of ROC. Also find the ROC of  $a^{|n|}$ ,  $a > 0$ . [4M]

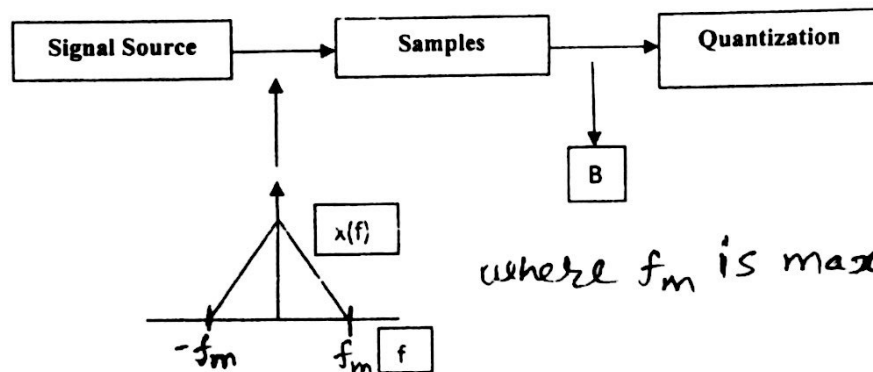
2) Two signals  $x_1(t) = \cos 20\pi t$  and  $x_2(t) = \cos 100\pi t$  are sampled with sampling frequency 40 Hz. Obtain the associated discrete time signals  $x_1(n)$  and  $x_2(n)$ . Also comment on the result.

B] What is sampling theorem? From figure , determine the output at point B for: [3M]

a)  $F_s = 1.5 f_m$

b)  $F_s = 2.0 f_m$

c)  $F_s = 3.0 f_m$



C] State and prove differentiation property of Z-transform with ROC? [3M]

Q4] Find out z-transform for the following signal:- [6M]

1)  $ne^n u(n+2)$

2)  $r(n)$ ; where  $r(n)$  is a ramp function.

Q5] Obtain the inverse z-transform of: using partial fraction expansion [4M]

$$x(z) = \frac{1}{(z-1)(z-3)}; \text{ Also Comment on ROC of } x(z).$$

or

Determine z-transform including ROC:  $x(n) = (1/2)^n \{u(n) - u(n-10)\}$ .

$$\frac{1-z^{-10}}{(1-z^{-1})}$$

$$\frac{1 + z^{-1} + z^{-2} + \dots + z^{-9}}{(1-z^{-1})}$$