Registration No: | | | | | | | | | | |

Total Number of Pages: 3 **B.TECH**
PET3I103

3rd Semester Regular Examination 2016-17
SIGNAL & SYSTEMS
BRANCH(S): ECE, ETC
Time: 3 Hours
Max Marks: 100
Q.CODE: Y603

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions: *dash fill up type*** **(2 x 10)**

a) All periodic signals are: _____ (energy/power/neither energy nor power)
b) The even part of the signal $x(n) = e^{j\frac{\pi}{3}n}$ is _____ .
c) The Twiddle factor W_N = _____ .
d) Autocorrelation function is _____ function.
e) Check the linearity of $y(n) = Ax(n) + B$: _____
f) For finite anti-causal sequence the ROC in Z-transform is _____.
g) The normalized cross-correlation sequence $\rho_{xy}(l)$ = _____ .
h) The exponential form of Fourier series of a periodic signal $x(t)$ with period T is defined by _____ .
i) The system function described by the difference equation $y(n) = \frac{1}{2}y(n-1) + 2x(n)$ is _____ .
j) If the DFT of $x(n) = X(K)$, then $DFT\{x(n-m)_N\}$ is _____ .

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) Describe all-zero system with an example.
b) Describe elementary signals: unit sample sequence and ramp signal.
c) Determine whether $x(n) = u(n)$ is energy or power signal,where $u(n)$ stands for unit step sequence.
d) Determine whether $x(n) = sin\left(\frac{6\pi}{7}n + 1\right)$ is periodic or not. If periodic find fundamental period.
e) Define time-reversal property in Z-transform with its ROC.
f) State Parseval's relation in Z-transform domain.
g) Define zero padding and its importance.
h) State and prove time shifting property of Fourier transform.
i) Prove $[x_1(n) * x_2(n)] = [x_2(n) * x_1(n)]$, i.e. convolution for LTI system is commutative.
j) Plot the discrete time sequence$y(n) = -2u(-n-2)$, where $u(n)$is unit step sequence.

Part – B (Answer any four questions)

Q3 **a)** Draw the direct form-I and form-II realization of the LTI system given as $2y(n) + y(n-1) - 2y(n-3) = x(n-1) + x(n-3)$. **(10)**

b) State the relationship between convolution and correlation and prove it. **(5)**

Q4 **a)** Determine the response of the LTI system whose input $x(n)$ and impulse response $h(n)$ are given by, $x(n) = \{\underset{\uparrow}{1}, 2, 3, 1\}$ and $h(n) = \{1, \underset{\uparrow}{2}, 1, -1\}$. Use graphical method to solve. **(10)**

b) Prove that for convolution of LTI system the distributive property holds. **(5)**

Q5 **a)** Derive convolution sum of LTI system and state its properties. **(10)**

b) Show that the necessary and sufficient condition for a relaxed LTI system to be BIBO stable is $\sum_{n=-\infty}^{\infty}|h(n)| \leq M_h < \infty$, for some constant M_h. **(5)**

Q6 **a)** Determine the response of LTI system governed by the difference equation, $y(n) - 0.5y(n-1) = x(n)$, for input $x(n) = (5)^n u(n)$, and initial condition $y(-1) = 2$. Use one-sided z-transform property. **(10)**

b) Find the Z-transform with its ROC for $n^2u(n) - 3^n u(-n-1)$. **(5)**

Q7 **a)** Find the inverse Z-transform of the following **(10)**

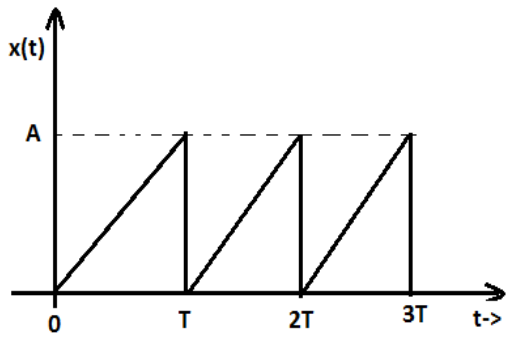
$$X(z) = \frac{1}{(1 + z^{-1})(1 - z^{-1})^2}$$

using partial-fraction expansion method.

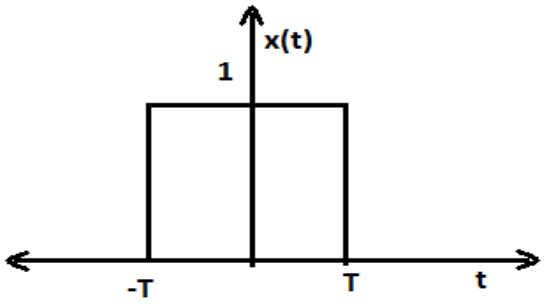
b) Compute 4-point DFT of the causal three sample sequence given by **(5)**

$$x(n) = \begin{cases} \frac{1}{3} & : \ 0 \leq n \leq 2 \\ 0 & : \ otherwise \end{cases}$$

Q8 **a)** Determine the Trigonometric form of Fourier series of the ramp signal shown below **(10)**



b) Determine the Fourier transform of rectangular pulse shown below **(5)**



Q9 **a)** Determine the total response $y(n), n \geq 0$ of the system described by the second order difference equation $y(n) - 2y(n-1) - 3y(n-2) = x(n) + 4x(n-1)$, when the input signal is $x(n) = 2^n u(n)$ and with initial condition $y(-2) = 0, y(-1) = 5$. **(10)**

b) Consider the following two sequences **(5)**
$x_1(n) = \{2,3,1,4\}$and $x_2(n) = \{5,2,1\}$. Find the circular convolution of $x_1(n)$and $x_2(n)$.