TE/Sem V/CBSGS/ETRX/SS/8-12-2017
&
RTC

Q.P.Code:27255

Time: 3 Hrs. **Total Marks: 80**

NOTE: - 1) Question number 1 is compulsory.
2) Attempt any three questions from the remaining five questions.
3) Assume suitable data wherever necessary.

Q1 a Verify periodicity of the following continuous time signals. If Periodic, find the Fundamental period. 5
(i)$x(t)= 3 \cos (5t+\pi/6)$
(ii) $x(t)=e^{-j2\pi t/7}$

b Prove that, Fourier transform of convolution of two signals is the product of the Fourier transform of the individual signals. 5

c What is the general condition for stability of a discrete time LTI system in z-domain? 5

d Find the convolution of following signals using Laplace Transform. 5
$X(t)=\cos(t).u(t)$, $y(t)=t.u(t)$

Q2 a Show that for LTI discrete time system, the inverse z-transform of transfer function is the impulse response of the system 4

b Determine power or energy of the following continuous time signal: 4
(i) $x(t)=e^{-2t}.u(t)$
(ii) $x(t)=3\cos(5mt)$

c Determine whether the following systems are linear/nonlinear, time variant/invariant, causal/noncausal, and stable/unstable. 12
(i) $y(t) = 3\,X(t) +5$
(ii) $y(t) = \sin(t).\, x(t)$

Q3 a Determine inverse Z transform for the following functions: 10

1) $x(z) = \frac{1}{1-1.5z^{-1}+0.5z^{-2}}$

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

b Determine the impulse response sequence of the discrete time LTI system defined by 10
$Y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$

Turn Over

Q4 a State the sampling theorem. Consider an analog signal $x(t) = 10 \cos 100\pi t$. If the sampling frequency is 75 Hz, find the discrete time signal x (n). 10

Also find an alias frequency corresponding to the sampling frequency of 75 Hz.

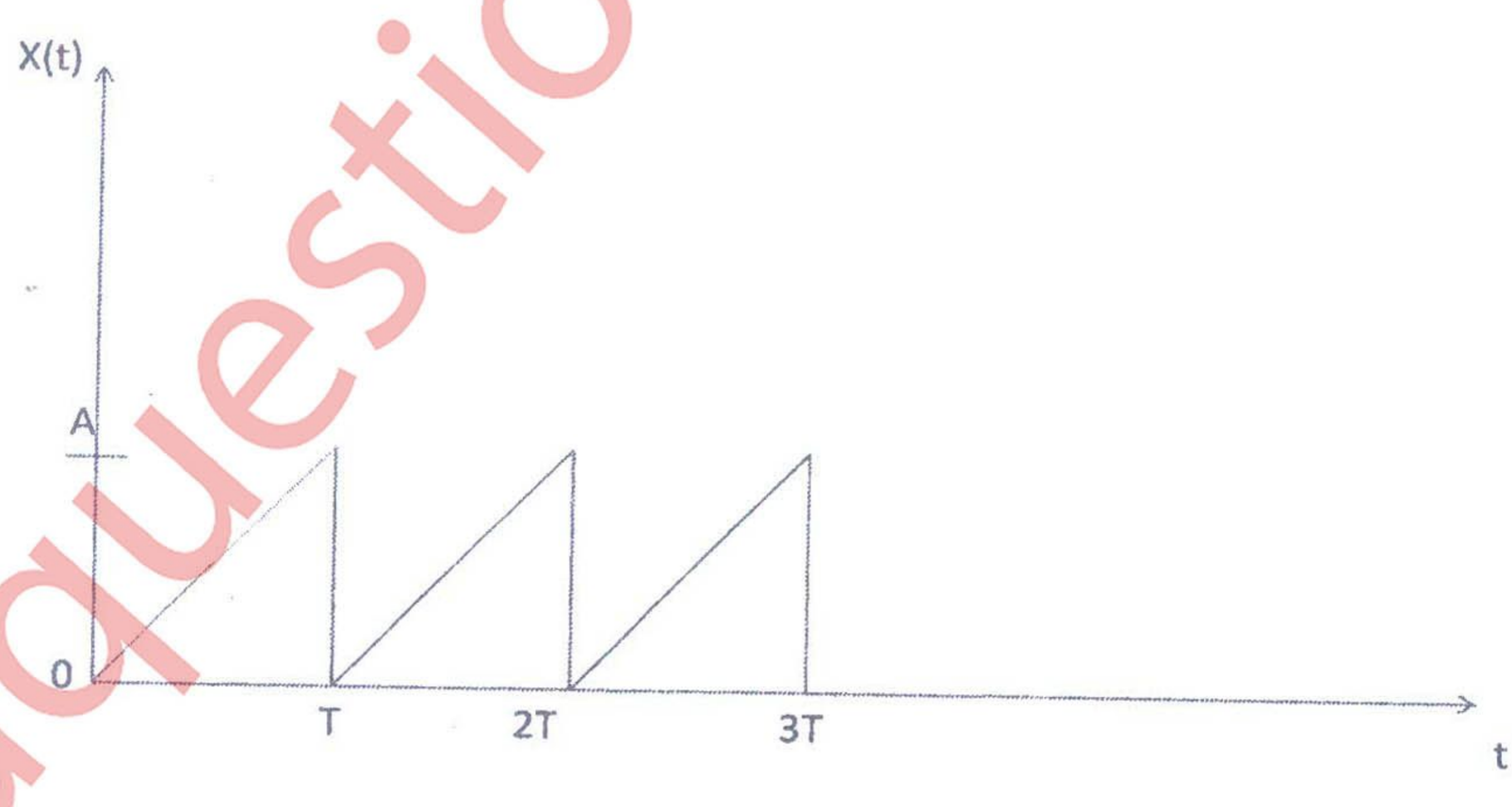
b Determine the complete response of the system described by the equation : 10

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = \frac{dx(t)}{dt};$$

$y(0) = 0$; $\frac{dy(t)}{dt} = 1 \; at \; t = 0$

For the input, $x(t) = e^{-2t}u(t)$

Q5 a Determine the trigonometric form of Fourier series for the ramp signal shown in figure:- 10



b Obtain inverse Laplace transform of $X(s) = \frac{2s^2+5s+5}{(s+2)(s+1)^2}$ for all possible ROC conditions. 10

Q6 a Perform convolution of the following signals, by graphical method and sketch the resultant signal. 10
$X1(t) = e^{-3t}u(t)$ and $X2(t) = t\,u(t)$

Q6 b Determine the Fourier transform of the periodic impulse function shown in figure:- 10