Code No: 53021 **R09**

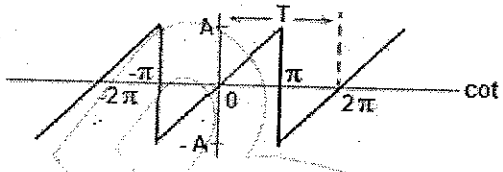
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, December-2014
SIGNALS AND SYSTEMS
(Common to ECE, EIE, BME, ETM, ICE)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Prove that the complex exponential signals are orthogonal functions.
b) Discuss the properties of Impulse function.
c) What is orthogonal signal space?

2.a) State and prove the time differentiation and time shifting properties of Fourier series.
b) Obtain the trigonometric Fourier series for the waveform shown below.



3.a) Find the Hilbert transform of $x(t)= \cos \omega_0 t$.
b) Find the Fourier transform of:
i) $x(t) = 5 \sin^2(3t)$ ii) $x(t) = 1/(a^2+t^2)$ iii) $x(t) = \exp(-at)\, u(t)$.

4.a) Obtain the conditions for distortion less transmission through a system.
b) Write a note on filter characteristics of linear systems.

5.a) Obtain the convolution of the signals $x(t) = \exp(-3t)\, u(t)$ and $h(t) = u(t+3)$.
b) Compare ESD and PSD.

6.a) Explain the flat top sampling in detail.
b) Discuss the aliasing and aperture effects and how can they avoided.

7.a) Find the inverse Laplace transform of the following:

$$X(S) = \frac{s^2+2s+5}{(s+3)(s+5)^2}$$

i) $\mathrm{Re}(S) < -5$ ii) $\mathrm{Re}(S) > -3$ iii) $-5 < \mathrm{Re}(S) < -3$.
b) Determine the Laplace transform of the signal $x(t) = \sin(\pi t)\, u(t)$ using periodicity property.

8.a) Determine the impulse response of the system described by the difference equation $y(n)-3y(n-1)-4y(n-2) = x(n)+2x(n-1)$.
b) For the signal $x(n) = -b^n\, u(-n-1)+ (0.5)^n\, u(n)$. Find the z-transform and plot the ROC.

---oOo---