Code: EC3T3

II B.Tech - I Semester–Regular/Supplementary Examinations November 2017

SIGNAL AND SYSTEMS
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours   Max. Marks: 70

PART – A
Answer *all* the questions.   All questions carry equal marks
$$11x\ 2 = 22\ M$$

1.

   a) Write Basic operations on signals.

   b) Obtain the Fourier transform of Signum Function

   c) State the properties of impulse signal .

   d) Derive the Laplace Transform of signal u(t-a).

   e) Write properties of Region of Convergence Laplace Transforms

   f) Find the initial value and final value of $X(s) = \frac{1}{s+3}$.

   g) Find the z-transform of $x(n) = (3)^n.u(n)$

   h) Give expression for discrete convolution and write its properties

   i) Check whether the signal is periodic or aperiodic signal. $e^{-a|t|}$ u (t)

   j) State and prove Time Convolution property of Fourier Series.

   k) What is aliasing?

PART – B

Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

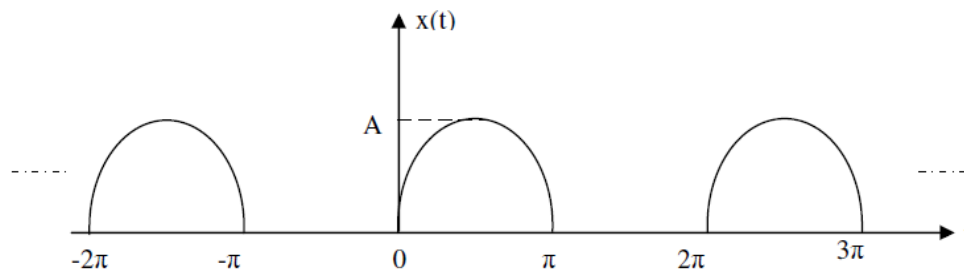2. a) Explain various continuous time signals.   8 M

   b) Check whether the following systems are linear, causal, stable and time invariant.   8 M
      i) $y(n) = x(n)-x(n-2)$ ii) $y(n) = a^n . u(n)$

3. a) Find the Fourier series expansion of the half wave rectified sine wave shown below.   8 M

   b) Explain the Exponential series in detail. Obtain the relation between exponential and Fourier Series Coefficients . 8 M

4. a) State and prove the following properties of Laplace Transform.   8 M
      i) Initial value theorem, ii) Convolution property
      iii) Final value theorem.

   b) Find the response of a system with transfer function $H(s)= 1/(s+4)*(s+5)$ with input $x(t)= e^{-2t} u(t)$.   8 M

5. a) Discuss the properties of DFS. 8 M

b) Prove the following properties of DTFT: 8 M
   i) Time convolution   ii)Parseval's relation
   iii) Periodicity   iv)Time reversal

6. a) Find Z-transform of the following signals and sketch
   Pole-Zero plot with ROC. 8 M
   i) $x(n) = a^n u(n) - b^n u(-n-1)$
   ii) $x(n) = a^n .\sin \omega n.u(n)$

b) Find the inverse z – transform of the following: 8 M
   i) $X(z) = \dfrac{z^2 + 2z}{z^3 - 3z^2 + 4z + 1}$;ROC $|z| > 1$,using Long Division
   method.
   ii) $X(z) = \dfrac{3z}{(z-1)(z-2)}$ plot ROC for $|z| > 2$, $|z| < 1$, $1 < |z| < 2$