Find the inverse z-transform of

$$x(z)=\frac{3z^{-1}}{(1-z^{-1})(1-2z^{-1})}$$

i) If ROC : $|z|>2$

ii) If ROC : $|z|<1$

iii) If ROC : $1<|z|<2$

Unit-V

5. a) State sampling theorem.

b) What is aliasing.

c) Determine the Nyquist rate of the following signals:

i) $x(t) = 1+\cos(2000\ \pi t) + \sin(4000\ \pi t)$

ii) $x(t)=\frac{\sin(4000\pi t)}{\pi t}$

d) A low pass signal x(t) has a spectrum x(f) given by

$$x(f)=1-\frac{|f|}{200},\ |f|<200$$

Assume that x(t) is ideally sampled at f_s = 300Hz. Sketch the spectrum of x_s (t).

OR

Explain in detail the sampling of a discrete time signals.

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Roll No .....

EE - 503

B.E. V Semester

Examination, June 2016

Signals and Systems

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit-I

1. a) Define singularity function with mathematical expression and waveforms.

b) What are the condition of causality and stability for any system?

c) Define Discrete convolution and state its properties.

d) Check whether the following systems are LTI system:

i) $\frac{d^3y(t)}{dt^3}+2\frac{d^2y(t)}{dt^2}+4\frac{dy(t)}{dt}+3y^2(t)=x(t+1)$

ii) $y(n) = a^n\ u(n)$

OR

Realize the system described by the following differential equation in direct form - II:

$$\frac{d^3y(t)}{dt^3}+4\frac{d^2y(t)}{dt^2}+3\frac{dy(t)}{dt}+6y(t)=$$
$$2\frac{d^2x(t)}{dt^2}+5\frac{dx(t)}{dt}+7x(t)$$

Unit-II

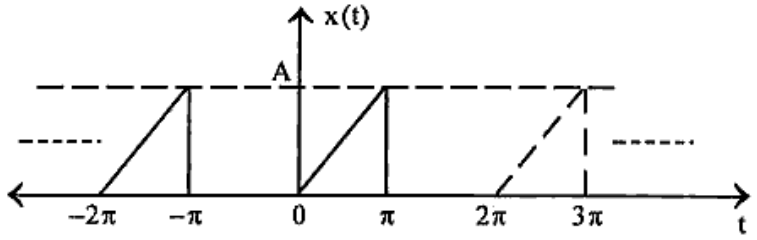
2. a) What are the three important classes of Fourier series methods available?
   b) Define Fourier transform with Mathematical expression.
   c) What are the conditions to be satisfied for the existence of Fourier transform?
   d) The input and output of a causal LTI system are described by the differential equation

$$\frac{d^2y(t)}{dt^2}+3\frac{dy(t)}{dt}+2y(t)=x(t)$$

   i) Find the frequency response of the system.
   ii) Find the impulse response of the system.

OR

Obtain the trigonometric Fourier series for the waveform shown in figure 2(d).



Unit-III

3. a) Define Fourier transform of a discrete-time signal with the condition for its existence.
   b) What is frequency response of LIT systems?
   c) State and prove the time shifting and frequency shifting properties of DTFT.
   d) Find the DTFT of the following sequences:
      i) $x(n) = 3^n u(n)$
      ii) $x(n) = (0.5)^n u(n) + 2^n u(-n-1)$

OR

A discrete system is given by the following difference equation:

$y(n)-5y(n-1) = x(n)+4x(n-1)$

Where x(n) is the input and y(n) is the output. Determine its magnitude and phase response.

Unit-IV

4. a) What is Region of Convergence (ROC) in terms of Laplace transform?
   b) State initial value theorem and final value theorem for z-transform.
   c) Determine the system function of a discrete time LTI system described by difference equation:

$$y(n)-\frac{1}{3}y(n-1)+\frac{1}{5}y(n-2)=x(n)-2x(n-1)$$

   d) State and prove the following properties of Laplace transform.
      i) Linearity property
      ii) Time scaling property
      iii) Time Reversal property

OR