

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No.: 22314 AS

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (E.C.E.) II Year II-Semester Advanced Supplementary Examinations, June/July-2017**

**Signal Analysis and Transform Techniques**

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

**Part-A (10 × 2 = 20 Marks)**

1. Define Power signals and Energy signals.
2. Draw the PSD of the signal  $\cos^2(\omega_0 t)$ .
3. Write Paley-wiener criterion for physical realization of system.
4. Why unit step signal does not have existence of Fourier series representation, even though its Fourier transform exists.
5. The input for an LTI system with transfer function  $H(s) = 1/(S+1)$  is  $e^{-2t} u(t)$ , then find output?
6. Write the condition on ROC for continuous and discrete systems to be Stable.
7. For the signal  $x(n) = \{-1 \ 0 \ -6 \ 1 \ 3 \ -7 \ 0 \ -3\}$ , Find its Z-transform and its ROC.  
↑
8. Relate DTFT with Z-Transform.
9.  $x(n) = u(n)$  signal is applied to the system having impulse response  $h(n) = \delta(n-3)$ . Determine the output of the system.
10. Distinguish between Correlation and Convolution integrals.

**Part-B (5 × 10 = 50 Marks)**

**(All bits carry equal marks)**

11. a) A rectangular function is defined by  $x(t) = 1$  for  $0 < t < \pi$  and  $-1$  for  $\pi < t < 2\pi$ . Approximate the above rectangular function by single sinusoid  $\sin(t)$  over the interval  $[0, 2\pi]$ , also evaluate the mean square error.  
b) With regard to Fourier series representation of continuous time periodic signal, Justify that the Odd functions have only sine terms and Even functions have no sine terms.
12. a) State and prove duality property and Modulation property of Fourier transform.  
b) Define Impulse response. If impulse response is  $h(t) = 4e^{-2t}u(t) + 3e^{-4t}u(t)$ , then comment on stability and causality of the system.
13. a) State and prove Sampling theorem for Band limited signals.  
b) Find Laplace transformation of the signal  $x(t) = t^2 \sin(at) u(t)$  and also evaluate its initial and final values.
14. a) Obtain the DT Fourier transform of  $x[n] = a^{|n|}$ ,  $|a| < 1$ .  
b) For the system defined by input - output relation as  $y(n) = 0.8y(n-1) + y(n-2) + 3x(n)$ . Find the  
i) Transfer function of the system  
ii) Impulse response  
iii) Frequency response

15. a) State and prove any three properties of autocorrelation of energy signals.  
b) Graphically obtain the convolution of the following two signals  $x(t)$  and  $h(t)$  where  $x(t) = u(t) - u(t-3)$  and  $h(t) = u(t) - u(t-2)$ .
16. a) Examine whether the following signals are Periodic or not? If periodic determine the fundamental period.  
i)  $x(t) = 2\sin(15\pi t) + 3\cos(25\pi t)$       ii)  $x[n] = 2\cos(n/6)\cos(n\pi/8)$
- b) Find Fourier transform of signals      i)  $x(t) = \frac{1}{\pi t}$  and      ii)  $y(t) = u(t)$
17. Write short notes on any *two* of the following:  
a) Properties of convolution  
b) Properties of ROC for continuous time signals  
c) Correspondence between S-Plane and Z-plane.

