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## VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD <br> B.E. (E.C.E.) II Year II-Semester Main \& Backlog Examinations, May-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

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\text { Part-A }(10 \times 2=20 \text { Marks })
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1. Find whether the given signal is power signal or energy signal.

2. Find the Fourier series of the signal $\operatorname{Cos}^{2}\left(\omega_{0} t\right)$.
3. Write the condition for existence of Fourier transform.
4. Draw the magnitude and phase response of Distortion less system.
5. Define ROC of continuous and discrete signals.
6. Determine the Initial and final values of continuous time impulse signal.
7. Determine DTFT of the signal $x(n)=-4 u(n-3)+\delta(n+3)$.
8. Find Z-transform of the signal $x(n)=0.3 u(n-1)$ and sketch its ROC.
9. Determine autocorrelation of the signal $x(n)=\delta(n)$.
10. Distinguish between convolution and correlation integrals.

Part-B $(5 \times 10=50$ Marks $)$
(All bits carry equal marks)
11. a) In case of signals what does the Orthogonality imply? If $X_{e}(t)$ and $x_{0}(t)$ are respectively the even and odd parts of a signal $x(t)$, show that they are orthogonal over the interval -T to T for any T .
b) For the given periodic signal find exponential Fourier series and draw the magnitude spectrum.

12. a) State and prove the time shifting and Convolution in time domain properties of Continuous time Fourier Transform.
b) Define step response. Determine the unit step response of an LTI system with impulse response $h(t)=e^{-2 t} u(t-2)$.
13. a) If $x(s)=\left(s^{2}+6 s+7\right) /\left(s^{2}+3 s+2\right) \operatorname{ROC} \operatorname{Re}(s) \leq 1$, is the Laplace transform of $x(t)$, obtain the inverse Laplace transform.
b) Consider an LTI system whose response to the input $x(t)=\left[2 e^{-t}-e^{-3}\right] u(t)$ is $y(t)=\left[3 e^{-2 t}-3 e^{-4 t}\right] u(t)$. Determine the Transfer function and Impulse response of the system.
14. a) Find DTFT of the sequence $x(n)$, where

$$
\begin{aligned}
x(n) & =2^{n} & & 0 \leq n \leq 3 \\
& =1-2^{n} & & 4 \leq n \leq 7 \\
& =0 & & \text { otherwise }
\end{aligned}
$$

b) Find Z-transform of the signal $x(n)=0.3^{|n|}$ and sketch its ROC.
15. a) Find correlation between two signals $x_{1}(n)=\{10346\}$ and $x_{2}(n)=\left\{\begin{array}{lll}2 & 3 & 4\end{array}\right\}$.
b) Find convolution between the two signals graphically $x(t)=[u(t)-2 u(t-1)+u(t-2)]$ and $h(t)=2 e^{-t} u(t)$.
16. a) A triangular pulse is shown in the figure below, sketch $x(-3 t+2)$.

b) Find Fourier transform of the signal shown below:

17. Write short notes on any two of the following:
a) Properties of ROC for discrete time signals
b) Sampling theorem
c) Properties of cross correlation of energy signals.

