SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :M.E - W-AEL
Title of the Paper :Transforms and Probabilities   Max. Marks :80
Sub. Code :735101   Time : 3 Hours
Date :11/05/2010   Session :FN

PART - A   (6 x 5 = 30)
Answer ALL the Questions

1. Compute the convolution of two four-point sequences $\{X(k)\} = \{1,2,3,4\}$ and $\{Y(k)\} = \{5,6,7,8\}$

2. Write a short note on Harr Wavelet function.

3. A continuous random variable X has a probability density function $f(x) = kx^2e^{-x}, x > 0$. Find 'k' and the mean.

4. The joint probability mass function of (X,Y) is given by $p(x,y) = k(2x + 3y), x = 0,1,2; y = 1,2,3$. Find the value of '$k$' and the marginal probability distribution of X and Y.

5. Classify the random processes with an example.

6. If the power spectral density of white noise is $\dfrac{N_0}{2}$, find its autocorrelation function.

7. Use a four point finite Fourier transform to compute the Fourier transform of $\{X(k)\}=\{1,2,3,4\}$

(or)

8. Find the discrete Fourier transform of the four – point sequence $\{X(k)\}=\{1,1,0,0\}$ and then find the inverse discrete Fourier transform of the result.

9. Derive the filter equations for discrete wavelet transform.

(or)

10. Write short notes on (i) Wavelet Decomposition (ii) Fast wavelet transform

11. Find the moment generating function of exponential distribution and hence find its mean and variance.

(or)

12. The marks obtained by a number of students in a certain subject are approximately normally distributed with mean 65 and standard deviation 5. If 3 students are selected at random from this group, what is the probability that atleast 1 of them would have scored above 75?

13. If the Wide Sense Stationary process $\{X(t)\}$ is given by $X(t)=10\cos(100t+\theta)$, where θ is uniformly distributed over $(-\pi,\pi)$. Prove that $\{X(t)\}$ is correlation ergodic.

(or)

14. Define power spectral density function. Find the power spectral density of a Wide Sense Stationary process with auto correlation function $R(\tau)=e^{-az^2}$

15. A petrol pump station has four pumps. The service time follows the exponential distribution with a mean of 6 minutes and cars arrive for service in a Poission process at the rate of 30 cars per hour.

(a) What is the probability that an arrival would have to wait in line?

(b) Find the average waiting time, average time spent in the system and average number of cars in the system

(c) For what percentage of time would a pump be idle on an average?

(or)

16. Automatic car wash facility operates with only one bay. Cars arrive according to a Poisson distribution with a mean of 4 cars per hour and may wait in the facilities parking lot if the bay is busy. If the service time for all cars is constant and equal to 10 minutes, determine L_s, L_q, W_s and W_q