Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91580

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fourth Semester

Electronics and Communication Engineering

MA 2261/MA 45 /MA 1253/ 080380009/ 10177 PR 401 — PROBABILITY AND RANDOM PROCESSES

(Common to Biomedical Engineering)

(Regulation 2008/2010)

Time : Three hours   Maximum : 100 marks

(Use of statistical tables is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find c, if a continuous random variable X has the density function $f(x)=\frac{c}{1+x^2}, -\infty < x < \infty$.

2. Find the moment generating function of Poisson distribution.

3. Given the random variable X with density function $f(x)=\begin{cases} 2x, & 0<x<1 \\ 0, & elsewhere \end{cases}$. Find the pdf of $Y=8X^3$.

4. Define the joint pmf of a two-dimensional discrete random variable.

5. Define stochastic processes.

6. Define Markov process.

7. Write any two properties of autocorrelation.

8. Write the Wiener-Khintchine relation.

9. Define white noise.

10. The autocorrelation function for a stationary ergodic process with no periodic component is $R_{xx}(\tau)=25+\frac{4}{1+6\tau^2}$. Find the mean and variance of the process $\{X(t)\}$.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Find the n^{th} moment about mean of normal distribution.

(ii) Derive Poisson distribution from the binomial distribution.

Or

(b) (i) Find the mean and variance of Gamma distribution.

(ii) A random variable X has the pdf $f(x)=\begin{cases}2e^{-2x}, & x \geq 0\\ 0, & x<0\end{cases}$. Obtain the mgf and first four moments about the origin. Find mean and variance of the same.

12. (a) 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 K and all the marginal and conditional probability distributions. Also find the probability distribution of $(X+Y)$

Or

(b) (i) State and prove central limit theorem.

(ii) The lifetime of a certain brand of an electric bulb may be considered a RV with mean 1200h and standard deviation 250h. Find the probability, using central limit theorem that the average lifetime of 60 bulbs exceed 1250h.

13. (a) (i) The process $\{X(t)\}$ whose probability distribution under certain condition is given by

$$P\{X(t)=n\} = \begin{cases}\dfrac{(at)^{n-1}}{(1+at)^{n+1}}; & n=1,2,.....\\ \dfrac{at}{1+at}; & n=0\end{cases}$$

Show that it is not stationary.

(ii) If the 2n random variables A_r and B_r are uncorrelated with zero mean and $E(A_r^2)=E(B_r^2)=\sigma_r^2$, show that the process $X(t)=\sum_{r=1}^{n}(A_r \cos w_r t + B_r \sin w_r t)$ is wide sense stationary. What are the mean and autocorrelation of $X(t)$?

Or

(b) (i) Define semi-random telegraph signal process and random telegraph signal process and prove also that the former is evolutionary and the latter is wide-sense stationary.

(ii) If $\{X(t)\}$ is a Gaussian process with $\mu(t)=10$ and $c(t_1,t_2)=16e^{-|t_1-t_2|}$ find the probability that (1) $X(10)\leq 8$ and (2) $|X(10)-X(6)|\leq 4$

14. (a) (i) The random binary transmission process $\{X(t)\}$ is a WSS process with zero mean and autocorrelation function $R(\tau)=1-\frac{|\tau|}{T}$, where T is a constant. Find the mean and variance of the time average of $\{X(t)\}$ over $(0,T)$. Is $\{X(t)\}$ mean ergodic?

(ii) Find the power spectral density of a WSS process with autocorrelation function $R(\tau)=e^{-\alpha\tau^2}$.

Or

(b) (i) A random process $\{X(t)\}$ is given by $X(t)=A\cos pt+B\sin pt$, where A and B are independent random variables such that $E(A)=E(B)=0$ and $E(A^2)=E(B^2)=\sigma^2$. Find the power spectral density of the process.

(ii) If the power spectral density of a WSS process is given by $S(w)=\begin{cases}\frac{b}{a}(a-|w|), & |w|\le a\\ 0, & |w|>a\end{cases}$, find the autocorrelation function of the process.

15. (a) (i) Check whether the following systems are linear (1) $y(t)=t\,x(t)$ (2) $y(t)=x^2(t)$.

(ii) The power spectral density of a signal $x(t)$ is $S_x(w)$ and its power is P. Find the power of the signal $bx(t)$.

Or

(b) A linear system is described by the impluse response $h(t)=\frac{1}{Rc}e^{-\left(\frac{t}{Rc}\right)}$. Assume an input signal whose autocorrelation function is $B\delta(\tau)$. Find the autocorrelation mean and power of the output.

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Question Paper Code : 61194

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fourth Semester

Electronics and Communication Engineering

EC 1251 A — ELECTRONIC CIRCUITS – II

(Regulation 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the Line Regulation and Load Regulation of a regulator.

2. What are the advantages of Bridge rectifier over Full wave Rectifier?

3. State the Bark Hausen criterion.

4. State any two parameters which affect the frequency stability of oscillators.

5. Mention the various components of Coil Losses.

6. Define the loaded Q, of a resonator.

7. Draw the circuit diagram for RC differentiator circuit.

8. Compare and contrast Astable multivibrator and Bistable Multivibrator.

9. Draw the response of Pulse transformer, for a pulse input.

10. Mention the applications of blocking oscillators.

PART B — (5 × 16 = 80 marks)

11. (a) Draw and Explain the working of a Full wave rectifier with resistive load. Also explain how the ripple voltage is affected by the use of C filter for the above circuit.

Or

(b) Draw the block diagram of SMPS, and explain the working of various blocks in it.

12. (a) With a neat diagram, explain the working of a Wien bridge oscillator. Derive the expression for frequency of oscillation.

Or

(b) Explain the working of a Colpitts oscillator, with a neat circuit diagram. Derive the expression for frequency of oscillation.

13. (a) Derive the design equations of a capacitor coupled single tuned amplifier.

Or

(b) What is meant by class C amplifier? Explain any one application of class C Tuned amplifier in detail.

14. (a) Explain the working of series positive clipper and series negative clipper with neat circuit diagrams and waveforms.

Or

(b) Explain the working of collector coupled astable multivibrator, with neat circuit diagram.

15. (a) Draw and explain the working of push pull astable Blocking oscillator.

Or

(b) Explain the method of linearization through adjustment of driving waveform in detail.
