Reg. No. :

Question Paper Code : 50781

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth Semester

Biomedical Engineering

MA 6451 – PROBABILITY AND RANDOM PROCESSES

(Common to Electronics and Communication Engineering/Robotics and Automation Engineering)

(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Write the formula for moment generating function of binomial distribution.

2. Suppose that the duration X in minutes of long distance calls from your home, follows exponential law with p.d.f. $f(x)=\begin{cases} e^{\frac{-x}{5}}, x>0 \\ 0, \text{otherwise} \end{cases}$ what is $P(X > 5)$?

3. Find the value of k, if $f(x, y) = k (1 - x) (1 - y)$ in $0 < x, y < 1$ and $f(x, y) = 0$, otherwise, is to be the joint density function.

4. The regression equations are $3x + 2y = 26$ and $6x + y = 31$. Find the means of X and Y.

5. What do you mean by wide sense stationary process ?

6. State the postulates of a Poisson process.

7. Prove that $R(\tau)$ is maximum at $\tau = 0$.

15. a) If {X(t)} is a WSS process and if $Y(t)=\int_{-\infty}^{\infty} h(u)\,X(t-u)\,du$, prove that : **(16)**

i) $R_{XY}(T) = R_{XX}(T) * h(-T)$, where * denotes convolution

ii) $R_{YY}(T) = R_{XY}(T) * h(T)$, where * denotes convolution

iii) $S_{XY}(\omega) = S_{XX}(\omega)H^*(\omega)$, $H^*(\omega)$ is the complex conjugate of $H(\omega)$

iv) $S_{XY}(\omega) = S_{XX}(\omega)\,|\,H(\omega)\,|^2$.

(OR)

b) i) If X(t) is the input voltage to a circuit and Y(t) is the output voltage, {X(t)} is a stationary random process with $\mu_x = 0$, and $R_{xx}(\tau) = e^{-\alpha|\tau|}$. Find μ_y, $S_{yy}(\omega)$ and $R_{yy}(T)$, if the power transfer function is $H(\omega)=\dfrac{R}{R+iL\omega}$. **(8)**

ii) A system has an impulse response $h(t) = e^{-\beta t}\,U(t)$, find the power spectral density of the output Y(t) corresponding to the input X(t). **(8)**

Reg. No. :

Question Paper Code : 52765

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth Semester

Biomedical Engineering

MA 2261 – PROBABILITY AND RANDOM PROCESSES

(Common to Electronics and Communication Engineering)

(Regulations 2008)

Time : Three Hours Maximum : 100 Marks

***Instruction** : Normal distribution table is **permitted**.*

Answer ALL questions

PART – A (10×2=20 Marks)

1. Classify the following random variables as continuous or discrete
   i) Number of incoming calls to your mobile phone on a particular day.
   ii) The time that you spend for studies during a day.

2. Under what conditions binomial distribution tends to Poisson distribution ?

3. Find the marginal distribution of X and Y from the bivariate probability distribution given below

	Y	
X	1	2
1	0.1	0.2
2	0.3	0.4

15. a) If $\{X(t)\}$ is a WSS process and if $Y(t) = \int_{-\infty}^{\infty} h(u)X(t-u)du$ then prove that.

i) $R_{XY}(\tau) = R_{XX}(\tau) * h(-\tau)$. (4)

ii) $R_{YY}(\tau) = R_{XY}(\tau) * h(\tau)$, where * denotes convolution. (4)

iii) $S_{XY}(\omega) = S_{XX}(\omega) H^*(\omega)$. (4)

iv) $S_{YY}(\omega) = S_{XX}(\omega) / H(\omega) /^2$. (4)

(OR)

b) The autocorrelation function of the Poisson increment process is given by

$$R(\tau) = \begin{cases} \lambda^2 & \text{for } |\tau| > \varepsilon \\ \lambda^2 + \dfrac{\lambda}{\varepsilon}\left(1 - \dfrac{|\tau|}{\varepsilon}\right) & \text{for } |\tau| \le \varepsilon \end{cases}$$

prove that its spectral density is given by $S(\omega) = 2\pi\lambda^2\delta(\omega) + \dfrac{4\lambda \sin^2(\omega\varepsilon/2)}{\varepsilon^2\omega^2}$ (16)