Enroll No.................   Roll No....................

JAMIA HAMDARD

Department of Computer Science & Engineering

School of Engineering Sciences & Technology

Odd Semester Exam 2022 (Supplementary/Improvement)

Paper Name: Mathematics-III   **Paper Code:** BTCSE-311

Time: 3 Hours   **Maximum Marks:** 75

Note: Mobile Phones or programmable calculator or any equipment with memory are not allowed inside the examination hall. Follow proper numbering for answering the questions.

Attempt all questions from section A (7*5=35), Any four questions from section B (4*10=40).

Section-A (Attempt all questions 7*5=35)

Q.N.	Question	Marks	CO	BL
1	Two cards are drawn with replacement from a well shuffled deck of 52 cards. Compute the variance for the number of aces.	5	CO2	L5
2	State and prove Mean Ergodic Theorem.	5	CO3	L3
3	If $\{X(t)\}$ be a random process such that $X(t)=\sin(wt+\theta)$ is a sinusoidal signal with random phase θ which is a uniform random variable in the interval $(-\pi,\pi)$. If both time t and the radial frequency w are constants, then find the probability density function of the random variable $X(t)$.	5	CO4	L5
4	Find k if $$f(x,y)=k(1-x)(1-y), 0<x,y<1$$ is the joint density function of (X,Y).	5	CO1	L5
5	A man draws 3 balls from an urn containing 5 white and 7 black balls. He gets Rs. 10 for each white ball and Rs. 5 for black ball. Find his expectation.	5	CO1	L1
6	Two bad eggs are mixed accidently with 10 good ones. Find the probability distribution of the number of bad eggs in 3, drawn at random, without replacement, from this lot.	5	CO2	L2
7	Find the power spectral density function of the random process whose autocorrelation function is given by $R(\tau)=e^{-a\tau^2}\cos b\tau$ where a and b are constants.	5	CO5	L5

Section- B (Attempt any four questions 4*10=40Marks)

Q.N.	Question	Marks	CO	BL
1	A die is thrown twice and the sum of numbers appearing is observed to be 6. What is the probability that the number 2 has appeared at least once.	10	CO3	L3
2	The joint PDF of (X,Y) is given by $f(x,y)=\begin{cases} kxy, & 0<x<4, \quad 1<y<5. \\ 0, & otherwise \end{cases}$ (i)Find the value of k. (ii) Determine marginal pdf of X and Y.	10	CO4	L5
3	If $\{X(t)\}$ is a random process with $\mu(t)=8$ and autocorrelation $R(t_1, t_2) = 64+10e^{-2\|t_1-t_2\|}$, then find mean and variance.	10	CO5	L5
4	A random process $\{X(t)\}$ has the probability distribution $P\{X(t)=x\}=\begin{cases} \frac{(at)^{x-1}}{(1+at)^{x+1}}, & x=1,2,3... \\ \frac{at}{1+at}, & x=0 \end{cases}$ Show that the process is not stationary.	10	CO5	L5
5	Write a note on (a)Conditional probability (b)Bayes theorem	10	CO 1	L5
6	Consider the continuous random process $\{X(t)\}$ such that $X(t)=A\cos(\omega t+\theta)$, where A is a random variable that has a uniform density in the range (-1,1). Find the mean of $\{X(t)\}$.	10	CO2	L5