

Name of the Student:

Register No.:

R	A														
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SRM Institute of Science and Technology  
College of Engineering and Technology  
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu  
Academic Year: 2023-2024 (EVEN)

C2-Slot  
SET-A

Test: FT-IV

Course Code & Title: 21MAB203T-Probability and Stochastic Processes

Year / Sem: II/IV

Date: 24/04/2024

Duration: 1 hr 40 Minutes.

Max. Marks: 50

At the end of this course, learners will be able to:		Program Outcomes (PO)											
Course Outcomes (CO)	Learning Bloom's Level	1	2	3	4	5	6	7	8	9	10	11	12
CO1 Evaluate the characteristics of discrete and continuous random variables	4	3	3										
CO2 Explain the model and analyze systems using two-dimensional random variables	4	3	3										
CO3 Classify limit theorems and evaluate upper bounds using various inequalities	4	3	3										
CO4 Analyze the characteristics of random processes	4	3	3										
CO5 Examine problems in spectral density functions and linear time-invariant systems	4	3	3										

Part-A (1 x 4 = 4 Marks)

Answer ALL the Questions

Q. No	Question	Marks	BL	CO	PO
1.	If the state space S of a random process is discrete and the parameter set T is continuous it is called (a) discrete random process (b) continuous random process (c) continuous random sequence (d) discrete sequence	1	1	4	1,2
2.	If the process $\{X(t)\}$ and $\{Y(t)\}$ are orthogonal then $R_{XY}(\tau) =$ (a) 0 (b) -1 (c) 1 (d) $R_{YX}(\tau)$	1	1	4	1,2
3.	If the input of the system is unit impulse then the output is (a) system weighting function (b) linear function (c) linear time invariant system (d) time invariant function	1	1	5	1,2
4.	If a system is such that its input and output are related by a convolution integral then the system is (a) unstable (b) transient (c) linear time invariant (d) saturated	1	1	5	1,2

Part - B (8 x 2 = 16 Marks)

Answer any two questions

5.	If $\{X(t)\}$ is a WSS process with autocorrelation function $R(\tau) = Ae^{-a \tau }$ determine the second order moment of the random variable $X(5) - X(3)$ .	8	2	4	1,2
6.	Given the PSD of a continuous process as $S_{XX}(\omega) = \frac{\omega^2 + 2}{\omega^4 + 13\omega^2 + 36}$ find the mean square value of the process.	8	4	4	1,2
7(i).	Find the mean of the stationary process $\{X(t)\}$ whose $R_{XX}(\tau) = 16 + \frac{9}{1 + 16\tau^2}$	4	3	5	1,2
7(ii).	If the impulse response to the system is given by $h(t) = e^{-t}$ , $t \geq 0$ find its power transfer $H(\omega)$ .	4	3	5	1,2



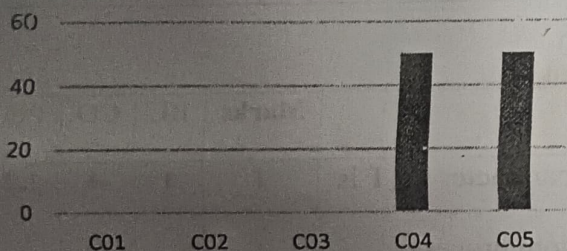
**Part - C (15 x 2 = 30 Marks)**

**Answer any two question**

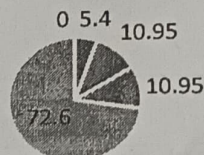
8.	Let two random processes $\{X(t)\}$ and $\{Y(t)\}$ be defined as $X(t) = A \cos \omega t + B \sin \omega t$ , $Y(t) = B \cos \omega t - A \sin \omega t$ where A and B are random variables, $\omega$ is a constant. If $E(A)=E(B)=0$ , $E(AB)=0$ and $E(A^2)=E(B^2)$ . Prove that $\{X(t)\}$ and $\{Y(t)\}$ are jointly WSS.	15	4	4	1,2
9.	If $X(t)$ and $Y(t)$ are uncorrelated random processes then find ACF of Z if $Z=X(t)+Y(t)$ . Using this ACF find $S_{ZZ}(\omega)$ .	15	4	4	1,2
10(i).	The autocorrelation function for a stationary process is given by $R_{XX}(\tau) = 9 + 2e^{- \tau }$ . Find the mean value of the random variable $Y(t) = \int_0^2 X(t)dt$ and variance of $X(t)$ .	8	4	5	1,2
10(ii).	The cross power spectrum of a real random process $X(t)$ and $Y(t)$ is given by $S_{XY}(\omega) = \begin{cases} a + jb\omega &  \omega  < 1 \\ 0 & \text{otherwise} \end{cases}$ Find cross correlation function.	7	4	5	1,2

**Course Outcome (CO) and Bloom's level (BL) Coverage in Questions**

**CO COVERAGE IN PERCENTAGE**



**BLOOM LEVEL IN PERCENTAGE**



■ BL1 ■ BL2 ■ BL3 ■ BL4 ■ BL5

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**Evaluation Sheet**

Part- A (4* 1= 4 Marks)			
Q. No	CO	Marks Obtained	Total
1	2		
2	2		
3	3		
4	3		
Part- B (8*2= 16 Marks)			
5	2		
6	3		
7(i)	2		
7(ii)	3		
Part- C (15*2= 30 Marks)			
8	2		
9	3		
10(i)	2		
10(ii)	3		

**Consolidated Marks:**

CO	Marks Scored
CO4	
CO5	
Total	