**Code No. ES303EC**

**METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution)**

**B.E. (ECE) III-Semester (AICTE) (Supplementary) Examination, AUGUST -2023**

**Subject: PROBABILITY THEORY AND STOCHASTIC PROCESS**

**Time: 3 hours Max.Marks:60**

**Note: Missing data, if any, maybe suitably assumed.**

**PART-A**

**Answer All the questions.**

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| **Q.No.** | **Questions** | **Marks** | **CO** | **BTL** |
| **1. a** | **If 4 of 25 electrical cables are defective and 5 of them are randomly choosen for inspection, what is the probability that only one of the defective cable will be included?** | **2** | **1** | **3** |
| **b** | **Explain Mutually Exclusive Events and Independent Events with an example?** | **2** | **1** | **2** |
| **c** | **Define moment generating function and characteristic function?** | **2** | **2** | **1** |
| **d** | **Define cumulative distributive function(CDF) and state its properties?** | **2** | **2** | **1** |
| **e** | **If X and Y are two uncorrelated random variables, prove that Var ( X + Y) = Var ( X) + Var ( Y ).** | **2** | **3** | **2** |
| **f** | **Prove that if two random variables are independent, then the Covariance is Zero.** | **2** | **3** | **2** |
| **g** | **Define the concept of wide sense stationary random process?** | **2** | **4** | **1** |
| **h** | **Define the terms Mean-Ergodic Process and Correlation-Ergodic Process.** | **2** | **4** | **1** |
| **i** | **Check whether the function below is valid power spectral density or not.** | **2** | **5** | **3** |
| **j** | **Briefly explain white noise and colored noise?** | **2** | **5** | **2** |

**PTO**

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**PART-B**

**Answer Any Five questions**.

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| **Q.No.** |  | **Questions** | **Marks** | **CO** | **BTL** |
| **2.** | **a** | **Companies B1, B2 and B3 produces 30%, 45% and 25% of the cars respectively. It is known that 2%,3% and 2% of these cars produced from B1,B2 and B3 are defective. What is the probability that the car purchased is defective?** | **4** | **1** | **3** |
| **b** | **An intercom system master station provides music to 6 hospital rooms. The probability that any one room will be switched ON and draw power at any time is 0.4.When ON, a room draw 0.5W. Find and plot the density and distribution functions for the random variable “power delivered by the master station”.** | **4** | **1** | **3** |
| **3.** | **a** | **Find the mean and variance of random variable X which is Poisson distributed?** | **4** | **2** | **3** |
| **b** | **A random variable X is uniformly distributed in the interval [-5,-15]. Another random variable y=e-x/5 is formed. Find the mean and vaiance of Y?** | **4** | **2** | **3** |
| **4.** | **a** | **State and prove any four properties of a joint distribution function.** | **4** | **3** | **2** |
| **b** | **Find the correlation coefficient of two random variables X and Y if E[X] = 4, E[Y] = 9, E[XY] = 100, E[X2] = 81 and E[Y2 ] = 256** | **4** | **3** | **3** |
| **5.** | **a** | **Consider a random process x(t)=Ao.cos(wot+θ) where Ao and wo are constants θ is a uniform random variable in the interval (0,π).Check whether the random process is wide sense stationary or not?** | **4** | **4** | **3** |
| **b** | **Find the power spectral density of the above random process x(t)?** | **4** | **4** | **3** |
| **6.** | **a** | **The spectral density of WSS random process x(t) is given by Sxx(w)= Find the autocorrelation of the random process x(t)?** | **4** | **5** | **3** |
| **b** | **Calculate the average power of the above random process x(t)?** | **4** | **5** | **3** |
| **7.** | **a** | **State and prove the theorem of total probability?** | **4** | **1** | **2** |
| **b** | **A continuous random variable X has pdf fx(x)=x(2-x) for 0≤x≤2. Determine the expectation of X?** | **4** | **2** | **3** |
| **8.** | **a** | **State and explain properties of joint distribution function?** | **4** | **3** | **2** |
| **b** | **Explain about first order, second order and Nth order stationary stochastic process.** | **4** | **4** | **2** |
| **9.** | **a** | **State and prove the properties of cross correlation function?** | **4** | **5** | **2** |
| **b** | **The first, second and third moments about origin are 1,16 and 40 respectively. Determine the mean, variance and third central moments?** | **4** | **2** | **3** |

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