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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_ **End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **11MA214/MA205/MA226/MA239** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **PROBABILITY AND RANDOM PROCESS** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | If S is the sample space, then P(S) = \_\_\_\_\_\_\_\_\_\_\_. | (1) |
| 2. | If A and B are independent events, then are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | (1) |
| 3. | Define a continuous random variable. | (1) |
| 4. | A random variable X has the following probability function.  x : 0 1 2 3 4  p (x) : k 3k 5k 7k 9k Find the value of k. | (1) |
| 5. | If the pdf of x is fx(x) = e-x, 0 < x < ∞, find the Pdf of y = 2x - 1. | (1) |
| 6. | If X is a discrete random variable and *a* is a constant, then E(*a*x) = \_\_\_\_\_\_\_\_\_\_\_. | (1) |
| 7. | Define wide sense stationary process. | (1) |
| 8. | Define evolutionary process | (1) |
| 9. | The sum of two independent poisson process is \_\_\_\_\_\_\_\_\_\_process | (1) |
| 10. | Define a linear system. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | State the axioms of probability | (3) |
| 12 | A continuous random variable X has a pdf f(x) =  Find the mean | (3) |
| 13 | Find the MGF of Binomial distribution. | (3) |
| 14 | If {X(s,t) } is a random process, what is the nature of X(s,t) when (i) s is fixed. (ii) t is fixed  (iii) s and t are fixed | (3) |
| 15 | State any three properties of Gaussian process | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | In a bolt factory, machines A, B, C manufacture 25%, 35%, 40% respectively. Out of the total of their output 5, 4, 2 percents are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it is manufactured by machine B? | (8) |
| b. | State and prove the addition theorem on probability. | (7) |
| (OR) | | | |
| 17. | a. | A and B alternately throw a pair of dice. A wins if he throws 6 before B throws 7 and B wins if he throws 7 before A throws 6. If A begins, then find his chance of winning the game. | (8) |
| b. | From a group of 3 Indians, 4 Pakistanis and 5 Americans, a subcommittee of four people is selected by lots. Find the probability that the subcommittee will consist of (i) 2 Indians and  2 Pakistanis and (ii) 1 Indian, 1 Pakistanis and 2 Americans (iii) 1 Indian and  3 Americans | (7) |
| 18. | For the bivariate probability distribution of (X,Y) given below, find P(X≤1),  P(Y≤3), P(X≤1,Y≤ 3), P(X≤1/Y≤3), P(Y≤3/ X ≤1) and P(X+Y ≤ 4).   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Y | 1 | 2 | 3 | 4 | 5 | 6 | | X | | 0 | 0 | 0 | 1/32 | 2/32 | 2/32 | 2/32 | | 1 | 1/16 | 1/16 | 1/8 | 1/8 | 1/8 | 1/8 | | 2 | 1/32 | 1/32 | 1/64 | 1/64 | 0 | 2/64 | | | (15) |
| (OR) | | | |
| 19. | The joint pdf of (X, Y) is given by f(x, y) =  (i) Find the value of K  (ii)Find the marginal density functions of X and Y.  (iii) Find the conditional density functions.  (iv) Check whether X and Y are independent or not . | | (15) |
| 20. | a. | If x and y are independent random variables with fx (x) = e-x and f­y (y) = 3e-3y , find fz (z) if | (8) |
| b. | If Y=X2,where X is a Gaussian random variable with zero mean and variance σ2,find the pdf of the random variableY. | (7) |
| (OR) | | | |
| 21. | a. | A RV X has mean µ=12 and variance σ2=9 and an unknown probability distribution Find P(6<X<18). | (8) |
| b. | The life time of certain brand of an electric bulb may be considered as a random variable  with mean 1200 h and standard deviation 250 h. Find the probability, using central limit theorem, that the average life time of 60 bulbs exceeds 1250h | (7) |
| 22. | Show that the random process X(t) = Acos(ω0t + θ) is wide sense stationary, if A  and ω0 are constant and θ is uniformly distributed RV in (0,2π). | | (15) |
| (OR) | | | |
| 23. | a. | The auto correlation function of a stationary process is R()= 16 + , find the mean and variance of x(t). | (8) |
| b. | If  is a WSS process with autocorrelation  then determine the second order moment of the random variable | (7) |
| 24. | It is given that Rx(τ) = e- |τ| for a certain stationary Gaussian random process {X(t)}. Find the joint pdf of the RVs X(t), X(t+1), X(t+2). | | (15) |
| (OR) | | | |
| 25. | If customers arrive at a counter in accordance with a Poisson Process with a mean rate of 2  per minute, find the probability that the interval between 2 consecutive arrivals is (i) more than  1 min. (ii) between 1 min. and 2 min. and (iii) 4 min. or less. | | (15) |

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