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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 :** | **11MA215/12MA214** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Probability and Random process for Engineers** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | If A and B are mutually exclusive events, then P(B/A) = \_\_\_\_\_\_\_\_\_\_\_ | (1) |
| 2. | For any event A, . | (1) |
| 3. | If the probability distribution of X is given as:  x: 1 2 3 4  px: 0.4 0.3 0.2 0.1  Find P(X ≤ 2). | (1) |
| 4. | If f(x) = kx3, 0 < x < 2 is to be a density function, find the value of k. | (1) |
| 5. | If the pdf of X is fx(x) = e-x, x > 0, find the pdf of Y = X2. | (1) |
| 6. | If X is a random variable and a is a constant, then E(aX) = \_\_\_\_\_\_\_\_\_. | (1) |
| 7. | Define WSS process. | (1) |
| 8. | Define autocorrelation of the process {X(t)}. | (1) |
| 9. | The poisson process is \_\_\_\_\_\_\_\_\_\_ process. | (1) |
| 10. | State any one property of Gaussian process. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | In a shooting test, the probability of hitting the target is ½ for A, 2/3 for B and ¾ for C. If all of them fire at the target, find the probability that none of them hits the target. | (3) |
| 12 | A random variable X has the following probability distribution.  x: -2 -1 0 1 2 3  P(x): 1/10 1/15 1/5 2/15 3/10 1/5  Find the mean of X. | (3) |
| 13 | If a RV X has the MGF M(t)=3/(3-t), find mean of X. | (3) |
| 14 | Define Strict Sense Stationary process. | (3) |
| 15 | A radio active source emits particles at a rate of 5 per minute in accordance with Poisson process. Each particle emitted has a probability 0.6 of being recorded. Find the probability that 10 particles are recorded in 4 min period. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | A lot consists of 10 good articles, 4 with minor defects and 2 with major defects. Two articles are chosen from the lot at random (without replacement). Find the probability that (i) both are good (ii) both have major defects (iii) at least 1 is good (iv) at most 1 is good (v) exactly 1 is good (vi) neither has major defects (vii) neither is good. | 15 |
| (OR) | | | |
| 17. | a. | If A and B are two independent events, prove that are also independent. | 5 |
| b. | A bolt is manufactured by three machines A, B and C. A turns out twice as many items as B, and machines B and C produce equal number of items. 2% of bolts produced by A and B are defective and 4% of bolts produced by C are defective. All bolts are put into 1 stock pile and 1 is chosen from the pile. What is the probability that it is defective? | 10 |
| 18. | a. | For the bivariate probability distribution of (X, Y) is  given below, find P (Y ≤ 3), P (X ≤ 1),  P (Y ≤ 3 / X ≤ 1), P (X + Y ≤ 4)  x  y   |  |  | | --- | --- | |  | 1 2 3 4 5 6 | | 0  1  2 | 0 0    0 | | 15 |
| (OR) | | | |
| 19. | a. | The joint density function of X and Y is    f (x, y) = k(x3y +xy3) , 0 < x < 2, 0 < y < 2  0 , otherwise    Find (i) the value of k (ii) the marginal densities of X and Y and (iii) the conditional density of X given Y. | 15 |
| 20. | a. | If the joint pdf of (X,Y) is given by f(x,y) = x+y, 0 ≤ x, y ≤ 1, find the pdf of U = XY. | 15 |
| (OR) | | | |
| 21. | a. | The joint pdf of (X,Y) is given by f(x,y) = 24xy, x > 0, y > 0, x + y ≤ 1. Find the conditional mean and variance of Y given X. | 15 |
| 22. | a. | Show that the random process X(t)=Acos(ωt+θ) is wide-sense stationary, if A and ω are constants and θ is a uniformly distributed random variable in (0, 2π). | 15 |
| (OR) | | | |
| 23. | a. | Two random processes X(t) and Y(t) are defined by X(t) = Acosωt+Bsinωt and Y(t)=Bcosωt-Asinωt. Show that X(t) and Y(t) are jointly WSS if A and B are uncorrelated random variables with zero means and the same variances and ω is a constant. | 15 |
| 24. | a. | If {X(t)} is a Gaussian process with μ(t)= 10 and , find the probability that (i) X(10)≤ 10 and (ii) |X(10)-X(6)|≤ 4. | 15 |
| (OR) | | | |
| 25. | a. | 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. | (7) |
| b. | State and prove any two properties of Poisson process. | (8) |

ALL THE BEST