****

**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**

**Subject Title: PROBABILITY DISTRIBUTION AND RANDOM PROCESS Time : 3 hours**

**Subject Code: 12MA221 Maximum Marks: 100**

#### **Answer ALL questions**

|  |  |  |
| --- | --- | --- |
| **Q.**  **No** | Question  **PART – A (10 X 1 = 10 MARKS)** | Marks  Allotted |
| 1 | If ‘A’ and ‘B’ are independent events then P(AUB)=---------- | 1 |
| 2. | If A and B are mutually exclusive events and P(A) = 0.29 and P(B) = 0.43, find P(A∩B). | 1 |
| 3. | A random variable X has the following probability function, find the value of k   |  |  |  |  |  | | --- | --- | --- | --- | --- | | x | 1 | 2 | 3 | 4 | | P(x) | 0.5 | k | 0.1 | 0.3 | | 1 |
| 4. | If the probability density function of a random variable is then find k. | 1 |
| 5. | Standard Deviation of Binomial distribution is \_\_\_\_\_\_\_\_\_\_\_\_\_. | 1 |
| 6. | The variance of the exponential distribution with parameter is ---------- | 1 |
| 7. | State Cauchy-Schwartz inequality | 1 |
| 8. | Define Moment Generating Function | 1 |
| 9. | Define Evolutionary process. | 1 |
| 10. | \_\_\_\_\_\_\_\_\_\_\_\_ | 1 |
| **PART – B (5 x 3 = 15 MARKS)** | | |
| 11. | If P(A) = 0.4, P(B) = 0.7 and P(A∪B) =0.5. find P(‾A∪‾B). | 3 |
| 12. | Find the value of k if f(x,y) = k(1-x-y+xy) for 0 <x,y<1 is to be a joint density function. | 3 |
| 13. | The mean and standard deviation of a binomial distribution are 5 and 2 respectively. Find n, p and q. | 3 |
| 14. | If the probability density function of f(x) = x/12, 1<x<5, find the pdf of Y = 2X-3. | 3 |
| 15. | Given that the autocorrelation function for a stationary ergodic process with no periodic components is . Find the mean and variance of the process. | 3 |
| **PART – C (5 x 15 = 75 MARKS)** | | |
| 16. a | Suppose that coloured balls are distributed in 3 boxes as follows:   |  |  |  |  | | --- | --- | --- | --- | |  | Box1 | Box2 | Box3 | | Red | 2 | 4 | 3 | | White | 3 | 1 | 4 | | Blue | 5 | 3 | 5 |   A box is selected at random from which a ball is selected at random and it is observed to be red. What is the probability that box3 was selected? | 10 |
| b. | State and prove addition theorem. | 5 |
| (OR) | | |
| 17. a. | A and B alternatively roll a pair of dice, A wins if he throws six before B throws 7 and B wins if he throws 7 before A throws six. If A begins the game what is the chance of B winning? | 8 |
| b. | There are two bags one of which contains 5 red and 8 black balls and the other 7 red and 10 black balls. A ball is drawn from first and placed in the second and then a ball is taken from bag 2. Find the chance of drawing a red ball. | 7 |
| 18. | A continuous RV X has a pdf f(x) = kx2e-x; x > 0. Find k, mean and variance, P(X>0/X<5). | 15 |
|  | (OR) |  |
| 19. | The joint probability mass function of (X,Y) is given by P(x,y) = k(x1+x2); x1=1,2;  x2 = 1,2. Find k. Find all the marginal and conditional probability distributions. | 15 |
| 20. | If 10% of the screws produced by an automatic machine are defective, find the probability that of 20 screws selected at random, there are (i) exactly two defectives (ii) atmost three defectives and (iii) atleast two defectives. | 15 |
|  | (OR) |  |
| 21. | The weekly wages of 1000 workman are normally distributed with mean Rs.70 and S.D of Rs. 5. Estimate number of workers whose wages will be (i) less than Rs.69 (ii) more than 72 (iii) between Rs. 69 and Rs.72 | 15 |
| 22. a. | If X is continuous RV with density function fX(x) = e-x, x>0, find the density function of Y = 2X+1. Also find P(Y>5) | 5 |
| b. | Find the Moment Generating Function of Binomial distribution and hence find its mean and variance. | 10 |
|  | (OR) |  |
| 23. a | A discrete random variable X takes the values -1,0,1 with probabilities 1/8, ¾, 1/8 respectively. Evaluate p{|X-μ|≥2σ} and compare it with the upper bound given by Tchebycheff’s inequlatiy. | 8 |
| b. | If X1, X2, …, Xn are Poisson variates with parameter λ=2, use the central limit theorem to estimate P{120≤Sn≤160} where Sn = X1+ X2+…+Xn and n = 75. | 7 |
| 24 | Two random processes {X(t)} and {Y(t)} are defined by X(t) = A cos wt + B sin wt and Y(t) = B cos wt – A sin wt . Show that {X(t)} and {Y(t)} are jointly wide sense stationary if A and B are uncorrelated RVs with zero means and the same variances. | 15 |
|  | (OR) |  |
| 25. a. | If the random process {X(t)}=A, Check whether {X(t)} is mean ergodic? | 6 |
| b. | If the power spectral density of a WSS process is given by    . Find the autocorrelation function of the process. | 9 |