Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **19MA3024** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PROBABILITY AND DISTRIBUTIONS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | State and prove Baye’s theorem. | CO5 | 10 |
| b. | In a certain factory, machines I, II and II are all producing springs of the same length. Machines I, II and III produce 1%, 4% and 2% of defective springs, respectively. Of the total production of springs in the factory, Machine I produces 30%, Machine II produces 25%, Machine III produces 45%, if one spring is selected at random from the total springs produced in a given day, determine the probability that it is defective. Given that the selected spring is defective, find the conditional probability that it was produced by Machine II. | CO5 | 10 |
| **(OR)** | | | | |
| 2. | a. | Person A tosses a coin and then person B rolls a die. This is repeated independently until a head or one of the numbers 1,2,3,4 appears, at which time the game is stopped. Person A wins with the head and B wins with one of the numbers 1,2,3,4. Compute the probability that A wins the game. | CO5 | 10 |
| b. | State and prove the addition theorem of probability for any three events A,B,C. | CO5 | 10 |
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| 3. | a. | The cdf of a continuous RV X is given by    Find the pdf of X and evaluate P(|X|≤1) and P(1/3 <X<4) using pdf and cdf. | CO1 | 10 |
| b. | Define the probability mass function of random variable X of sum of up faces on a roll of a pair of 6 sided dice. Find CDF and Mean. Find the probability that X is an even number. | CO1 | 10 |
| **(OR)** | | | | |
| 4. | a. | If the pdf of random variable X is f(x) = 2x; 0<x<1, then find pdf of  Y = X2 | CO1 | 10 |
| b. | The probability mass function of a random variable X is  p(x)= c(2/3)x ; x= 1,2,3,…….  (i) find c (ii) Find the mean and (iii) Variance of X. | CO1 | 10 |
|  |  |  |  |  |
| 5. | a. | Let and have the joint pdf.  Find:  (i) marginal density functions  (ii) conditional probability density functions  (iii) conditional mean of , given  (iv) conditional variance of , given  (v) | CO4 | 10 |
| b. | A coin is tossed three times, let X denote the number of heads on first two tosses, and Y denote the number of heads on all three tosses, define the joint probability mass function of (X,Y), find marginal and conditional probability distributions, check whether X and Y are independent. | CO4 | 10 |
| **(OR)** | | | | |
| 6. | a. | If X1 and X2 have the joint pdf  Then find the pdf of | CO2 | 10 |
| b. | The random variables X and Y have the joint probability mass function p(x,y) = 1/3, (x,y) = (0,0), (1,1), (2,2), zero otherwise. Compute the correlation coefficient of X and Y. | CO2 | 10 |
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| 7. | a. | Find the MGF of Gamma distribution and hence find its mean and variance. | CO3 | 10 |
| b. | If the MGF of a random variable X is ,  Find:  (i) the probability function of X  (ii) mean and variance of X  (iii) P(0<X< 3). | CO3 | 10 |
| **(OR)** | | | | |
| 8. | a. | Derive the probability density function of t-distribution. | CO3 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | State and prove central limit theorem. | CO6 | 10 |
| b. | If denote the mean of a random sample of size 75 from the distribution that has the pdf f(x) = 1; 0<x<1, then  find P( 0.45 << 0.55). | CO6 | 10 |