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



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

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| **Code :** | **17MA2015** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PROBABILITY, RANDOM PROCESS AND NUMERICAL METHODS** | **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. | A lot consists of 10 good articles, 4 with minor defects and 2 with major defects. Two articles are chosen at random. Find the probability that;  (i) both are good (ii) both have major defects  (iii) atleast one is good (iv) atmost one is good  (v) exactly one is good. | CO1 | 10 |
| b. | A and B throws alternatively a pair of dice. A wins the game, if he throws 6 before B throws 7. B wins the game, if he throws 7 before A throws 6. If A begins the game, what is the probability of his winning? | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | In a bolt factory machines A, B, C produce 25%, 35% and 40% of the total output respectively of their output 5% , 4% and 2% respectively are defective bolts. If a bolt chosen at random from the combined output. What is the probability that it is defective? If a bolt chosen at random is found to be defective, what is the probability that it was produced by B? | CO1 | 10 |
| b. | A problem is given to 3 students whose chances of solving it are 1/2,1/3 and 1/4. What is the probability that (i) Exactly two of them solves the problem (ii) atleast one of the solves the problem.(iii) None of them solves the problem? | CO1 | 10 |
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| 3. | a. | The random variable X has the following probability distribution   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | *x* | -2 | -1 | 0 | 1 | 2 | 3 | | *p(x)* | 0.1 | K | 0.2 | 2K | 0.3 | 3K |   (i) Find K (ii) Evaluate *P(X<2)* and *P(-2<X<2)*  (iii) Find the cdf of X (iv) Evaluate the mean of X. | CO1 | 10 |
|  | b. | A continuous random variable X has the probability density function  Find (i) the value of k (ii) Mean of X(iii) P(X<4). | CO1 | 10 |
| **(OR)** | | | | |
| 4. | a. | The joint probability mass function of (X,Y) is P(x,y)= K(2X+Y), x= 0,1,2, y = 1,2,3 Find (i) K (ii) Marginal probability distribution (iii) Conditional probability distribution | CO1 | 10 |
|  | b. | The joint pdf of the random variables (X,Y) is given by . Find the value of k and also prove that X and Y are independent. | CO1 | 10 |
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| 5. | a. | Fit a Binomial Distribution to the following data and find theoretical frequencies.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | | f | 5 | 18 | 28 | 12 | 7 | 6 | 4 | | CO2 | 10 |

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|  | b. | The weekly wages of 1000 workmen are normally distributed around a mean of Rs.70 with a standard deviation of Rs.5. Estimate the number of workers whose weekly wages will be;  (i) More than Rs.72 (ii) Less than Rs.69  (iii) Between Rs.69 and Rs.72 | CO2 | 10 |
| **(OR)** | | | | |
| 6. | a. | The time (in hours) required to repair a machine is exponentially distributed with parameter λ = 1/2. (i) What is the probability that a repair time exceeds 2 hours? (ii) What is the conditional probability that a repair takes atleast 10 hrs given that its duration exceeds 9 hrs? | CO2 | 10 |
|  | b. | A random variable X has a mean μ = 12 and variance σ2= 9 and an unknown distribution. Find P(6<X<18). | CO2 | 10 |
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| 7. |  | Two random processes and are defined by  and Show that and are jointly wide sense process, where‘’ and ‘’ are random variables. If;  (i) (ii) (iii) | CO3 | 20 |
| **(OR)** | | | | |
| 8. | a. | Evaluate by using (i) Trapezoidal rule (ii) Simpson’s rule. | CO5 | 10 |
|  | b. | The population of a certain town is given below:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Year (X) | 1931 | 1941 | 1951 | 1961 | 1971 | | Population (in1000s) (Y) | 40.62 | 60.80 | 79.95 | 103.56 | 132.65 |   Find the rate of growth of the population in 1931 and 1971. | CO6 | 10 |
|  | | **Compulsory**: |  |  |
| 9. |  | Find the value of y at x=0.1 using;  (i) Euler’s method (ii) Taylor’s method  (iii) Fourth order Runge-Kutta methods for the differential  equation of given y(0)=1. | CO6 | 20 |