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



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

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| **Code :** | **17MA2020** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PROBABILITY, RANDOM VARIABLES AND STATISTICS** | **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. | Calculate the first four moments about the mean.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Marks | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | | No.of students | 8 | 12 | 20 | 30 | 15 | 10 | 5 | | CO1 | 10 |
| b. | The first four moments of a distribution about x=2 are 1,2.5,5.5 and 16. Calculate the four moments about the mean. Also find the coefficient of skewness and Kurtosis. | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | In a shooting test the probability of hitting the target is  for A,  for B and  for C. If all of them fire at the target, find the probability that (i) none of them hits the target (ii) atleast one of them hits the target (iii) exactly two of them hit the target . | CO4 | 10 |
| b. | The chances of A, B and C becoming the general manager of a certain company are in the ratio 4:2:3. The probabilities that the bonus scheme will be introduced in the company,if A ,B and C become general manager are 0.3,0.7 and 0.8 respectively. If the bonus scheme has been introduced, what is the probability that A has been appointed as general manager? | CO4 | 10 |
|  |  |  |  |  |
| 3. | a. | A continuous RV X that can assume any value between x = 2 and  x = 5 has a density function given by. Find:  (i) the value of k (ii) (iii) mean and variance | CO2 | 10 |
| b. | For the bivariate probability distribution of given below:  **(**i) find (ii) (iii) P  (iv) P   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | Y | | | | | | | X | 1 | 2 | 3 | 4 | 5 | 6 | | 0 | 0 | 0 |  |  |  |  | | 1 |  |  |  |  |  |  | | 2 |  |  |  |  | 0 |  | | CO2 | 10 |
| **(OR)** | | | | |
| 4. | a. | A random variable ‘X’ has the following distribution.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | x | -2 | -1 | 0 | 1 | 2 | 3 | | P(x) | 0.1 | K | 0.2 | 2k | 0.3 | 3k |   (i) Find the value of k (ii) P(-2<x<2) (iii) P(x<2) (iv) Find the cumulative distribution function of x (v) Find mean and variance | CO2 | 10 |
| b. | The joint probability mass function of (X, Y) is given by  f(x, y) = k (2x + 3y), x = 0, 1, 2; y =1, 2, 3. Find:  (i) the value of k  (ii) all the marginal and conditional probability distributions.  (iii) the probability distribution of X +Y | CO2 | 10 |
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| 5. | a. | A set of 8 symmetrical coins were tossed 256 times and their frequencies of throws observed were as follows.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | f | 6 | 20 | 28 | 12 | 8 | 6 | 0 | 0 | 0 |   Fit a binomial distribution to this data and calculate the expected frequencies. | CO3 | 10 |
| b. | 1000 light bulbs with a mean life of 120 days are installed in a new factory; their length of life is normally distributed with standard deviation 20 days. How many bulbs will expire (i) in less than 90 days (ii) more than 90 days (iii) between 75 and 90 days? | CO3 | 10 |
| **(OR)** | | | | |
| 6. | a. | The distribution of typing mistakes committed by a typist is given below. Assuming a Poisson mode, find out the expected frequencies:   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | No. of mistakes per page | 0 | 1 | 2 | 3 | 4 | 5 | | No. of pages | 142 | 156 | 69 | 27 | 5 | 1 | | CO3 | 10 |
| b. | The milage which car owners get with certain type of radial tire as a random variable having exponential distribution with mean of 40000km.Find the probability that one of the tires will lost (i) atleast 20000km (ii) atmost 30000km (iii) between 2000km and 3000km. | CO3 | 10 |
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| 7. | a. | Random samples of 400 men and 600 women were asked whether they would like to have a school near their residence. 200 men and 325 women were in favour of the project. Test the hypothesis that the proportion of men and women in favour of the project are the same at (i)1% (ii) 5% level of significance. | CO5 | 10 |
| b. | A simple sample of heights of 6400 English men has a mean of 170 cm and standard deviation of 6.4 cm, while a simple sample of heights of 1600 Americans has a mean of 172 cm and an standard deviation of 6.3 cm. Do the data indicate that Americans are, on the average, taller than the English men? | CO5 | 10 |
| **(OR)** | | | | |
| 8. | a. | Two samples are drawn from two normal population. From the following data, test whether the two samples have the same variance at 5 % level:   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample1 | 17 | 27 | 18 | 25 | 27 | 29 | 27 | 23 | 17 | | Sample2 | 16 | 16 | 20 | 16 | 20 | 17 | 15 | 21 | - | | CO5 | 10 |
| b. | A manager of pizza hut was interested to determine whether sales of pizza is greater on one day of the week than another. His records from the past, shows the following result. Test whether sales of pizza is uniformly distributed over the week.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Days of the week | Mon | Tue | Wed | Thu | Fri | | No.of pizzas sold | 66 | 57 | 54 | 48 | 75 | | CO5 | 10 |
|  | | **Compulsory**: |  |  |
| 9. |  | The following data represent the number of units of production per day turned out by 5 different workers using 4 different types of machines:  A B C D  1 44 38 47 36  2 46 40 52 43  Workers 3 34 36 44 32  4 43 38 46 33  5 38 42 49 39    (i) Test whether the five men differ with respect to mean  productivity.  (ii) Test whether the mean productivity is the same for the four  different machine types. | CO6 | 20 |