**AUTUMN MID SEMESTER EXAMINATION-2022**

**B.Tech   
3rd Semester (*Regular) SAS-2022***



**Subject: Probability and Statistics**

**Code: MA-2011**

**Full Marks: 20 Time: 1.5 Hrs**

**Answer any four questions including question No. 1 which is compulsory.The figures in the margin indicate full marks.**

**Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only**

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Answer the following questions

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| 1. (a) Consider the three different brands of cars (BMW, Ferrari) purchased by each of six [5×1=5]   different customers at a certain showroom. If P(all six purchase BMW) , and P(all six purchase Ferrari), what is the probability that at least one of each brand is purchased?  (b) If for a Poisson distribution , then find the variance of the distribution.  (c) Let be the cdf of such that and  Find?  (d) Let be the event that project 1 is successful and be the event that project 2 is sucssesful. Suppose  that and are independent events with and . What is the probability that only  project 2 is successful if it is given that at least one of the project is successful?  (e) Let has discrete uniform distribution with pmf *,n*. If , then  determine the value of .   1. (a) A certain system can experience three different types of defects. Let denote the event that the system has a defect of type. Suppose that   and .   1. What is the probability that the system has at least one type defect? 2. Given that the system has a type 1 defect, what is the probability that it has all three types of defects? [2.5]   (b) Let be a random variable with pmf , for some constant . Sketch the cdf of  *X* for [2.5]   1. (a) Explain geometric distribution. Give an exampl**e.** Find the mean and variance of this distribution.   [2.5]  (b) A particular telephone number is used to receive both voice calls and fax messages. Suppose that  of the incoming calls involve fax messages, and consider a sample of incoming calls. [2.5]  What is the probability that   1. At least of the calls involve a fax message? 2. At most of the calls involve a fax message with given that at least of the calls involve   a fax message?   1. (a) Let , the number of flaws on the surface of a randomly selected boiler of a certain type, have a Poisson distribution with parameter . Compute the following probabilities: [2.5] 2. . 3. What is the probability that is within 2 standard deviation of its mean value?   (b) A family has expectation of getting a male child is 6/7. Suppose that . A couple wishes to have exactly two female children in their family. They will have children until this condition is fulfilled. [2.5]   1. What is the probability that the family has male children? 2. What is the probability that the family has at most four children? 3. Determine the upper bound for . 4. (a) Each of 12 refrigerators of a certain type has been returned to a distributor because of an audible, high-pitched, oscillating noise when the refrigerators are running. Suppose that 7 of these refrigerators have a defective compressor and the other 5 have less serious problems. If the refrigerators are examined in random order, let be the number among the first 6 examined that have a defective compressor. Compute the following: [2.5] 5. 4) 6. The probability that exceeds its mean value by more than 1 standard deviation.   (b) Prove that the hypergeometric pmf approaches to bionomial pmf if *M* and  *N* are relatively large, and . Compare the values by taking  and . [2.5] |