

**Kalinga Institute of Industrial Technology**

**Deemed to be University, Bhubaneswar**

**Mid Semester Examination-SPRING-2020**

**Probability & Statistics**

**MA-2011**

**Semester- 4th**

**Time: 1 hour 30 minutes Full Marks: 20**

***Answer four questions including question number 1***

***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.***

1. Answer all parts.

|  |  |  |  |
| --- | --- | --- | --- |
| 1. A die is thrown 4 times. Find the probability of getting at least one “six”. | | | |
| 1. For any events and  with , show that . | | | |
| 1. Find the suitable value of , for which the function, represents a probability mass function. | | | |
| 1. Find , given that mean of *X*  is 6. | | | |
| 1. Show that , where  are constants where denotes variance of random variable . | | | |
|  | (a) | Suppose that 55% of all adults regularly consume coffee, 45% regularly consume carbonated soda , and 70% regularly consume at least one of these two products.   * + 1. What is the probability that a randomly selected adult regularly consumes both coffee and soda?     2. What is the probability that a randomly selected adult doesn’t regularly consume at least one of these two products? | [3] |
|  | (b) | A boiler has five identical relief valves. The probability that any particular valve will open on demand is 0.95. Assuming independent operation of the valves, calculate (at least one valve opens ) and (at least one valve fails to open). | [2] |
|  |  | The probability density function of a random variable *X* is  (i) Determine the value of the constant ,  (ii) Find using distribution function of | [1+2] |
|  |  | For any events , show that | [2] |
|  |  | Find the mean and variance of the binomial (*n*, *p*) distribution. | [3] |
|  |  | Show that . | [2] |
|  |  | A mail-order computer business has six telephone lines. Let denote the number of lines in use at a specified time. Suppose the pmf of is given in the accompanying table.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |  | 0.10 | 0.15 | 0.20 | 0.25 | 0.20 | 0.06 | 0.04 |   Calculate the probability of each of the following events.   1. {between two and four lines , inclusive, are not in use} 2. {at least four lines are not in use} | [2] |
|  |  | A chemical supply company currently has in stock 100 lb of a certain chemical, which it sells to customers in 5-lb batches. Let = the number of batches ordered by a randomly chosen customer, and suppose that has pmf   |  |  |  |  |  | | --- | --- | --- | --- | --- | | *x* | 1 | 2 | 3 | 4 | | *p*(*x*) | 0.2 | 0.4 | 0.3 | 0.1 |   Compute  and . Then compute the expected number of pounds left after the next customer’s order is shipped and the variance of the number of pounds left | [3] |

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