**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

**Work Integrated Learning Programmes Division**

Cluster Programme - M. Tech in Data Science and Engineering

II Semester , 2020 – 21(July 2021)

Mid semester Examination (**Regular**)

Course No : DSECL ZC413

Course Title : Introduction to Statistical Methods

Nature of Exam. : Open Book (Online)

*Number of questions: 7*

*Number of Pages: 2*

Weightage : 30 Marks

Duration : 120 minutes

Date : 11th July 2021

Q.1. Consider the following data related to the employees ,who are on travel. **[3 Marks]**

40% check work email, 20% use cell phone to stay connected to work, 25% bring laptop with them, 23% check both work email and use cell phone to stay connected, and 50% neither check work email nor use a cell phone to stay connected nor bring a laptop. In addition, 88 out of every 100 who bring a laptop also check work email, and 70 out of every 100 who use a cell phone to stay connected also bring a laptop.

i) What is the probability that a randomly selected traveller who checks work email also uses a cell phone to stay connected?

ii) What is the probability that someone who brings a laptop on vacation also uses a cell phone to stay connected?

iii) If the randomly selected traveler checked work email and brought a laptop, what is the probability that he/she uses a cell phone to stay connected?

Q2). In a sample of 100 nails,18 of them have only defective heads,12 contain defective tail ends and 9 contain both defectives. What is the probability that a nail selected at random is either a defective head or a defective tail? **[5 Marks]**

Q3. A random variable X is having probability distribution function is given by **[5 Marks]**

, x = 0,1,2,3….with k = 2

1. Is it a valid distribution? Justify. If valid then find the following
2. P( x > 2)
3. P( 1 < x < 3)

Q4. Consider the following Joint distribution of two random variables X and Y **[5 Marks]**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **X \ Y->** | **1** | **2** | **3** | **4** | **5** | **6** |
| **1** | 0 | 0 | 2k | 4k | 4k | 6k |
| **2** | 4k | 4k | 8k | 8k | 8k | 8k |
| **3** | 2k | 2k | k | k | 0 | 2k |

1. For what value(s) of k it is a valid distribution
2. Find Marginal Distribution of X and Y
3. Find
4. Find )
5. Find )

Q5a. BITSAT is conducted every year by BITS for admission to three campuses. Among the eligible students the average score is 320 with a standard deviation of 40. What is the probability that when a random score is drawn, it ranges from 300 to 340? ( Assume that scores follows normal distribution). **[3 Marks]**

Q5b..At an Airport, scanners are installed to detect certain objects. A scan can detect a certain target with a probability of 0.2 during a single scan. **[3 Marks]**

Find the probability that

1. The target will be detected at least two times in five consecutive scans
2. At least once in fifteen scans.

Q6.A manufacturing plant has 500 employees with average age as 35 years with standard deviation of 9 years. If a sample of 49 employees is randomly selected, what is the probability that the sample average will be less than 32 years? **[3 Marks]**

Q7.A sample of size 42 is having mean 20, then find the interval estimation of population mean by considering standard deviation of sample as 2.(Take 92% Confidence level) **[3 Marks]**

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