University of Vavuniya

First Examination in Information Technology - 2020

First Semester - April/May 2022

IT1152 Essentials of Statistics

Answer Four Questions Only

(Non-programmable calculator is allowed to be used)

Allowed Time : Two hours

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1. (a) Distinguish between "primary data" and "secondary data". [20%]

   (b) To evaluate a processor's effectiveness for a certain type of task, a research student recorded the CPU time for 30 randomly chosen jobs (in seconds). The data is given below:

70	36	43	69	82	48	34	62	35	15
59	139	46	37	42	30	55	56	36	82
38	89	54	25	35	24	22	9	56	19

   i. Construct the stem-and-leaf plot. [10%]

   ii. Compute the five-number summary. [25%]

   iii. Construct the box plot, and comment on it. [10%]

   iv. Check whether there are any outlying CPU times. [10%]

   (c) The following data set represents the number of new computer accounts registered during ten consecutive days (Treat data as a population).

   | 43 | 37 | 50 | 51 | 58 | 105 | 52 | 45 | 45 | 10 |

   Calculate the mean, variance, and standard deviation. [25%]

1

2. (a) i. What is a mutually exclusive event? State the addition theorem on probabilities for non-mutually exclusive events. [20%]

ii. During some construction, a network blackout occurs on Monday with probability 0.7 and on Tuesday with probability 0.5. Suppose there is a probability of experiencing network blackouts on both Monday and Tuesday is 0.35.

A. What is the probability that there is no blackout on Monday? [10%]

B. What is the probability of having a blackout on Monday or Tuesday? [10%]

C. What is the probability of having a blackout only on Tuesday? [10%]

D. What is the probability that there is no blackout on Monday or Tuesday? [10%]

(b) i. If two events A and B are dependent, then define the probability of B given A. [10%]

ii. Ninety percent of flights depart on time. Eighty percent of flights arrive on time. Seventy-five percent of flights depart on time and arrive on time.

A. You are meeting a flight that departed on time. What is the probability that it will arrive on time? [10%]

B. You have met a flight, and it arrived on time. What is the probability that it departed on time? [10%]

C. Are the events, departing on time and arriving on time, independent? [10%]

3. (a) i. Define independent events, and state the multiplication rule for independent events. [20%]

ii. A computer program consists of two blocks written independently by two different programmers. The first block has an error with a probability of 0.2. The second block has an error with a probability of 0.3. If the program returns an error, what is the probability that there is an error in both blocks? [20%]

[To be continued on next page]

2

(b) i. State Bayes' theorem. [20%]

ii. A computer maker receives parts from three suppliers, S1, S2, and S3. Fifty percent come from S1, twenty percent from S2, and thirty percent from S3. Among all the parts supplied by S1, 5% are defective. For S2 and S3, the portion of defective parts is 3% and 6%, respectively. A customer complains that a certain part in her recently purchased computer is defective.

A. What is the probability that it was supplied by S1? [20%]

B. What is the probability that it was supplied by S3? [20%]

4. (a) i. What do you mean by random variable? [10%]

ii. A computer virus is trying to corrupt two files. Suppose that this virus is corrupting each file with probability 0.4 (Assume that those two files are independent of each other).

A. Obtain the probability distribution for the number of corrupted files. [15%]

B. What is the probability that the virus corrupts no files? [5%]

C. What is the probability that the virus corrupts at least one file? [10%]

D. Calculate the mean and standard deviation of the distribution. [15%]

(b) i. State the condition for Binomial distribution, and define its probability mass function. [15%]

ii. A computer virus attacked a lab network consisting of 20 computers. This virus enters each computer with probability 0.4, independently of other computers. Find the probability that

A. it entered only ten computers, [10%]

B. it entered at least four computers, and [10%]

C. it entered at most four computers. [10%]

5. (a) i. If we know the expected number of successes in a given interval, define an appropriate distribution to calculate the probability of x successes are occurring in the interval. [15%]

ii. Customers of an Internet service provider initiate new accounts at the average rate of 5 accounts per day.

A. What is the probability that more than four new accounts will be initiated on a particular day? [10%]

B. What is the probability that more than eight accounts will be initiated within two days? [15%]

(b) i. Write down the properties of normal distribution. [20%]

ii. A computer software package generates random numbers that are normally distributed with a mean and standard deviation that are entered by the user. Suppose that the user enters a mean of 400 and a standard deviation of 100. Find the probability that a value will be [10%]

A. above 490, [10%]

B. below 535, [10%]

C. between 525 and 650, and [10%]

D. between 340 and 714.