Tribhuvan University
Institute of Science and Technology
2076

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Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (STA. 164)
(Statistics I)
Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Group A

Long answer questions:
Attempt any Two questions: (2x10=20)

1. What are the roles of measure of dispersion in descriptive statistics? Following table gives the frequency distribution of thickness of computer chips (in nanometer) manufactured by two companies.

Thickness of computer chips		5	10	15	20	25	30
Number of chips by	Company A	10	15	24	20	18	13
	Company B	12	18	20	22	24	4

Which company may be considered more consistent in terms of thickness of computer chips? Apply appropriate descriptive statistics.

2. A study was done to study the effect of ambient temperature on the electric power consumed by a chemical plant. Following table gives the data which were collected from an experimental pilot plant.

Temperature(^{0}F)	27	45	72	58	31	60	34	74
Electric power (BTU)	250	285	320	295	265	298	267	321

(i) Identify which one is response variable, and fit a simple regression line, assuming that the relationship between them is linear.
(ii) Interpret the regression coefficient with reference to your problem.
(iii) Obtain coefficient of determination, and interpret this.
(iv) Based on the fitted model in (a), predict the power consumption for an ambient temperature of 65^{0}F.

3. (a) Define Normal distribution. What are the main characteristic of a Normal distribution?
(b) What do you mean by probability density function? Write down its properties.

Group B

Short answer questions:
Attempt any Eight questions: (8x5=40)

4. The following table gives the installation time (in minutes) for hardware on 50 different computers.

Installation time	0-10	10-20	20-30	30-40	40-50	Total
Number of computers	4	-	10	-	10	50

If the average installation time is 30.2 minutes, find missing frequencies.

5. The length of power failure in minute are recorded in the following table.

Power failure time	22	23	24	25	26	27	28	Total
frequency	2	5	7	10	4	3	2	33

Find Q_3, D_2 and P_{40} and interpret the results.

6. A manufacturing company employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In facts, plan 1,2 and 3 are used for 30%, 20% and 50% of the products respectively. The defect rate in different procedures is as follows: $P(D/P_1) = 0.01$, $P(D/P_2) = 0.03$, $P(D/P_3) = 0.02$, where $P(D/P_j)$ is the probability of a defective product, given plan j. If a random product was observed and found to be defective, which plan was most likely used and thus responsible?

7. The random variable X has following probability distribution.

X	0	1	2	3	4	5	6
P(X=x)	0.03	0.15	0.4	0.2	0.1	.07	.05

Find (i) E(X) and var(X) (ii) Calculate E(Y) if Y = 3X + 5.

8. If two random variables have the joint probability density function

$$f(x,y) = \begin{cases} k(2x+3y), for\ 0 \le x \le 1, 0 \le y \le 1 \\ 0, otherwise \end{cases}$$

Find (i) constant k (ii) Conditional probability density function of X given Y (iii) Identify whether X and Y are independent.

9. A large chain retailer purchases a certain kind of electronic device from a manufacturer. The manufacturer indicates that the defective rate of the device is 15%. The inspector randomly picks 10 items from a shipment. What is the probability that there will be at least one defective item among these 10?

10. Messages arrive at an electronic message center at random times, with an average of 9 messages per hour.
    a) What is the probability of receiving at least four messages during the next hour?
    b) What is the probability of receiving at most three messages during the next hour?

11. Following data represent the preference of 10 students studying B.Sc.(CSIT) towards two brands of computers namely DELL and HP.

Computer	*Student preference*									
Lenovo	5	2	9	8	1	10	3	4	6	7
Acer	10	5	1	3	8	6	2	7	9	4

Apply appropriate statistical tool to measure whether the brand preference is correlated. Also interpret your result.

12. What do you mean by measurement scale? Describe the different types of measurement scales used in statistics.

13. What is sampling? Discuss various probability sampling techniques with merits and demerits.