Hajee Mohammad Danesh Science and Technology University, Dinajpur
B. Sc. in CSE Level 2 Semester I, Final Examination (Jan-June), 2018
Course Title: Introduction to Basic statistics and Probability, Course Code: STT 227
Full Marks: 90 Time: 3 hours

The figures in the right margin indicate full marks
Answer any **three** questions from each section

SECTION-A

1. a. Define statistics as subject and variable with different types. 4

   b. What is frequency distribution? How will you construct a frequency distribution from raw data? 5

   c. An electronics company manufactures power supplies for a personal computer. They produce several hundred power supplies each shift and each unit is subjected to a 12-hour burn-in test. The number of units failing during this 12-hour test in each shift is shown below: 6

   3, 4, 2, 5, 6, 10, 5, 4, 3, 11, 9, 2, 7, 8, 4, 2, 6, 5, 4, 3, 2, 8, 10, 9, 11, 6, 7, 9, 10, 14

   Construct the frequency distribution table from the given data with a suitable class interval.

2. a. What do you mean by measures of central tendency? Write down different measures of central tendency. What is the best measure of central tendency and why? 4

   b. Discuss arithmetic mean with its properties, merits, demerits and uses. 5

   c. The shelf life of high-speed photographic film is being investigated by the manufacturer. The following result are available: 6

Life (in week)	5-7	7-9	9-11	11-13	13-15	15-17
No. of films	5	10	11	16	5	3

   Calculate the median and mode of the shelf life of high-speed photographic film.

3. a. Briefly describe the dispersion of data. Explain why we need dispersion of data. 4

   b. Show that standard deviation is independent of change of origin but dependent on a scale. 5

   c. The distribution of failure time (in months) of processors from different brands are shown below 6

Failure time	20-25	25-30	30-35	35-40	40-45
No of processors	12	16	8	9	5

   Calculate the standard deviation and comment about the result.

4. a. What is correlation analysis? Discuss simple, partial and multiple correlations. 4

   b. What is a scatter diagram? Draw the scatter diagram for different types of correlations. 5

   c. *Motor Trend* magazine frequently represents performance data for automobiles. The table below presents data from the *Motor Trend* concerning the gasoline mileage performance and the engine displacement (in cubic inches) for 7 automobiles. 6

Miles/Gallon	18.90	17.00	20.00	18.25	20.07	11.20	22.12
Displacement	350	350	250	351	225	440	231

   Calculate the correlation coefficient and comment on the relationship between mileage and engine displacement.

SECTION-B

1. a. Define coefficient of determination. If coefficient of determination is found to be 0.75, what will be your comment? 4

   b. Briefly discuss regression analysis with a model. Write down the properties of regression coefficient and uses of regression analysis. 5

   c. Using the data from Question 4 in **Section A.** 6

   (i) Fit the lest-square regression model of mileage on displacement.

   (ii) Estimate the mileage if the engine displacement is 400 cubic inches.

2. a. What is the classical and empirical approach of a probability? Write down the properties of the probability. 4

   b. Define conditional probability, special rule of addition, general rule of addition, special rule of multiplication and general rule of multiplication. 5

   c. 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. 6

   (i) Mr. Jack is meeting a flight that departed on time. What is the probability that it will arrive on time?

   (ii) Mr. Jack is meeting a flight that arrived on time. What is the probability that it will departed on time?

3. a. Discuss Binomial distribution. Write down the conditions for Binomial distribution. 4

   b. Define normal distribution and standard normal distribution. Write down some important uses of normal distribution. 5

   c. As part of a business strategy, randomly selected 20% of new internet service subscribers receive a special promotion from the provider. A group of 10 neighbors signs for the service. What is the probability that (i) none of them, (ii) at least 2 of them, (iii) at most 8 of them get that special promotion? 6

4. a. Define test of a hypothesis. Write down different steps for the hypothesis testing. 4

   b. Write down the hypothesis and test statistic for the following situations: 5

   (i) test for a specified value of a single mean (large sample), (ii) test of significance of equality of two means for independent samples (small samples), (iii) test of significance of equality of two means for paired observations, (iv) test of significance of correlation coefficient, (v) test for a specified value of a single mean (small sample).

   c. A manufacturer of video display units is testing two microcircuit designs to determine whether they produce equivalent current flow. Development engineering has obtained the following data 6

	Sample size	Sample mean	Sample variance
Design 1	8	91.73	3.89
Design 2	8	93.75	4.02

Consider the critical value at 5% level is 2.145.