

Level: Bachelor
Programme: BE
Course: Probability and Statistics

Semester: Spring

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

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1. a) The daily wages of workers of a factory are given below:

Wages (Rs.)	300-310	310-320	320-330	330-350	350-370	370-410
No. of workers	8	10	20	18	16	12

- Construct a histogram and frequency polygon for the data.
 - Draw an ogive for the data and estimate the median age.
- b) The lives of two models(A and B) of refrigerators in a recent survey are shown below:

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Life(No. of years)	No. of refrigerators	
	Model A	Model B
0-2	5	2
2-4	16	7
4-6	13	12
6-8	7	19
8-10	5	9
10-12	4	1

- What is the average life of each model of these refrigerators?
- Which model has greater uniformity?

2. a) The following are the numbers of minutes that a person had to wait for the bus to work on 15 working days,

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10, 1, 13, 9, 5, 9, 2, 10, 3, 8, 6, 17, 2, 10, 15

Draw a box plot and interpret the result.

- b) A student knew only 60% of the questions in a test each with 5 answers. He simply guessed while answering the test. What is

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probability that he knew the answer to a question given that he answered it correctly?

- a) Suppose the time it takes a data collection operator to fill out an electronic form for a database is uniformly distributed between 1.5 and 2.2 minutes.

- What is the mean and variance of the time it takes an operator to fill out the form?
- What is the probability that it will take less than two minutes to fill out the form?
- Determine the cumulative distribution function of the time it takes to fill out the form.

- b) In an examination, 30% of the candidates obtained marks below 40 and 10% of candidates got above 75 marks. Assuming that the marks are normally distributed, find mean and standard deviation of the distribution.

- a) In a certain city, the daily consumption of electric power (in millions of kilowatt-hours) can be treated as a random variable having a gamma distribution with $\alpha = 3$ and $\beta = 2$. If the power plant of this city has a daily capacity of 12 millions kilowatt hours. What is the mean of this gamma distribution? What is the probability that this power supply will be inadequate on any given day?

- b) The probability density function of two random variables X & Y is given by:

$$f(x, y) = \frac{1}{8}(4 - x - y), \quad 0 < x < 2, 0 < y < 2$$

$$= 0, \text{ otherwise}$$

Find:

- The marginal distribution of X and Y.
 - $P(X \geq 1, Y \geq 1)$
 - Are X and Y dependent or independent?
- a) A manufacturer of electronic calculators takes a random sample of 1200 calculators and finds that there are eight defective units.
- Construct a 95% confidence interval on the population proportion.
 - Is there evidence to support a claim that the fraction of

defective units produced is 1% or less?

- b) The following random samples are measurements of the heat producing capacity (in millions of calories per 100kg) of specimens of coal from two mines,

Mine 1: 82 81 83 80 83

Mine 2: 72 78 79 81 79 78

Use the 0.01 level of significance to test whether the difference between the means of these two mines is significant.

6. a) The quantity demanded of a certain product before advertisement and after advertisement is given below.

Before advertisement	50	40	45	50	60	70	35	38	60	70
After advertisement	55	41	51	51	55	75	50	54	70	78

Is the advertisement effective? Test at 5% level of significance.

- b) An instructor is interested in finding out the relationship between the number of students absent in school (y) and the day temperature (x). A random sample of 10 days was used for the study. The following table gives the record of the study.

Temperature(x)	10	20	25	30	40	45	50	55	59	60
No. of absent students(y)	8	7	5	4	2	3	5	6	8	9

Find the regression equation to estimate the no. of students absent in the school when the temperature is 65. Also find the standard error of estimate.

7. Write short notes on: (Any two)

- P-value and critical value.
- Characteristics of normal distribution.
- Probability Sampling.