

TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Probability and Statistics (SH 505)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Necessary tables are attached herewith.
- ✓ Assume suitable data if necessary.

1. Following is the age distribution of 1000 persons working in a factory.

Age Group	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of person	60	122	135	242	148	107	85	63	38

[6]

Due to heavy loss, the management decides to bring down the strength to 50 percent of the present number according to following scheme:

- (i) to retrench the first 8% from the lower group
- (ii) to absorb the next 32% in other branches.
- (iii) to make 10% from highest age group retire premature.

What will be the age limits of the persons retained in the mill and of those transferred to other branches?

2. a) Define the terms: (i) Mutually exclusive events (ii) Independent events.
- b) Customers are used to evaluate preliminary product designs. In the past, 95% of highly successful products received good reviews, 60% of moderately successful products received good reviews, and 10% of poor products received good reviews. In addition, 40% of products have been highly successful, 35% have been moderately successful, and 25% have been poor products.
 - (i) What is the probability that a product attains a good review?
 - (ii) If a new design attains a good review, what is the probability that it will be a highly successful product?

[2]

3. Define Hypergeometric Distribution. How does it differ from Binomial Distribution? Write the approximation condition for approaching Hypergeometric to Binomial Distribution.

[4]

4. Three people toss a coin and odd man pays for the coffee. If the coins all turns up the same, they toss gain. Find the probability that fewer than 4 tosses are needed.

[5]

5. Let the continuous random variable X denote the diameter of a hole drilled in a sheet metal component. The target diameter is 12.5 millimeters. Most random disturbances to the process result in larger diameters. Historical data show that the distribution of X can be modeled by a probability density function $f(x) = 20e^{-20(x-12.5)}$, $x \geq 12.5$. If a part with a diameter larger than 12.60 millimeters is scrapped,

[5]

- a) What proportion of parts is scrapped?
- b) What proportion of parts is between 12.5 and 12.6 millimeters?

[5]

6. Under what conditions, the Poisson distribution can be approximated using Normal distribution. Of a large group of men, 5% are under 60 inches in height and 40% are between 60 and 65 inches. Assuming a normal distribution, find the mean height and standard deviation.

[5]

7. Define the terms:

[5]

- a) Parameter, statistic
- b) Sample
- c) Sampling distribution of mean
- d) Standard error of mean?

8. An auditor for a large credit card company, knows that on average, the monthly balance of any given customer is 112 and the standard deviation is 56. If the audits 50 randomly selected accounts, what is the probability that the sample average monthly balance is (a) below 100 (b) between 100 and 130?

[5]

9. Define the correlation coefficients and state its important properties.

[5]

10. An investigation of the relationship between traffic flow x (1000's of cars per 24 hours) and lead content y of bark on trees near the highway ($\mu\text{g/g}$ dry wt.) yielded the following data:

[5]

X_i	8.3	8.3	12.1	12.1	17.0	17.0	17.0	24.3	24.3	24.3	33.6
Y_i	227	312	362	521	640	539	728	945	738	759	1263

- a) Find the estimated regression line to estimate lead content from traffic flow.
- b) Compute a 95% confidence interval for the slope of the true regression line.

11. It is claimed that an automobile is driven on the average is 12000 miles per year. To test this claim a random sample of 100 automobile owners are asked to keep a record of the miles they travel. Would you agree that average miles driven is greater than claimed value if the random showed an average of 14,500 miles and a standard deviation of 8,000 miles? Use a 0.01 level of significance.

[5]

Or,

I is claimed that a new diet will reduce a person's weight by 10 pounds on the average in a period of 2 weeks. The weights of seven women who followed this diet were recorded before and after a 2 week period.

Woman	1	2	3	4	5	6	7
Weight Before	129	133	136	152	141	138	125
Weight After	130	121	128	137	129	132	120

Test the manufacturer's claim at 5% level of significance.

12. A study compared the number of hours of relief provided by five different brands of antacid administered to 25 different people, each with stomach acid considered strong. The results are given below.

[5]

		Brand				
	A	B	C	D	E	
	4.6	5.2	5.9	2.7	4.3	
	4.5	4.9	4.9	2.9	3.8	
	4.1	4.7	4.6	3.9	5.2	
	3.8	4.6	4.3	4.3	4.4	

Calculate the F ratio. At the 0.05 level of significance, do the brands produce significantly different amounts of relief to people with strong stomach acid?

13. A random sample of 200 married men, all retired, were classified according to education and number of children.

[5]

Education	Number of children		
	0-1	2-3	over 3
Elementary	14	37	32
Secondary	19	42	17
College	12	17	10

Test the hypothesis at 0.05 level of significance, that the size of the family is independent of the level of education attained by the father.

14. A random sample of 100 men and 100 women at a college is asked if they have an automobile on campus. If 31 of the men and 24 of the women have cars, can we conclude that more men than women have cars on the campus? Use a 0.01 level significance. [5]

15. The following are the annual maximum flows in m^3/s in a river for 52-year period: [8]

1980	3120	2120	1700	2550
1700	1570	2830	2120	2410
1420	1980	2690	3260	1840
1980	4960	2120	2550	4250
2690	2270	5660	5950	3400
8500	3260	3960	2270	2410
2550	1980	2120	2410	3170
2410	1840	3120	3290	4550
1980	4670	1700	2410	3310
3120	2070	1470	2410	1130
3230	3090			

- a) Find descriptive statistics: maximum, minimum, sample mean, range, sample standard deviation, standard error of mean.
 b) Find approximate a 95% confidence interval for true average of rate of maximum flow.
