

B. CHEM 2ND YEAR 2ND SEMESTER EXAM 2018 (OLD)

STATISTICAL METHODS

Time: Three Hours

Full Marks: 100

Answer any four questions
Assume any missing data

(i) For a distribution of 250 observations, mean = 50 and standard deviation = 3. On checking it was discovered that observations which should correctly read as 60 and 85 had been wrongly recorded as 64 and 80 respectively. Calculate the correct values of mean and standard deviations.

(ii) A committee was formed to study the problem of parking places at a college. It was found that 10 percent of the students were enrolled in classes 1 day a week, 15 percent had classes 2 days a week, 30 percent attended classes on 3 days, 25 percent were in class 4 days a week, and 20 percent had classes on 5 days.

- Construct a probability distribution table for x (the number of days a student is enrolled in classes at the college).
- Construct a probability histogram for x .
- What's the probability a student is enrolled at least 3 days a week?
- Calculate the expected value for x .

(iii) A factory finds that, on average, 20% of the bolts produced by a given machine will be defective for certain specified requirements. If 10 bolts are selected at random from the day's production of this machine, find the probability (a) that exactly 2 will be defective, (b) that 2 or more will be defective, and (c) that more than 5 will be defective. [8+8+9]

(i) A study of male and female students selected in different streams produced the following Table

Stream Name	Male	Female	Total
Science	379	247	626
Commerce	283	151	434
Arts	399	263	662
Medical	322	222	544
Engineering	5477	4259	9736
Total	6860	5142	12002

A student is chosen random from this area. Find the probability that a student selected in

- Arts or Medical
- A male in science
- Either in medical or a male
- A female, given that she is selected in engineering

Now, are the events of being female and being selected in engineering

- Mutually exclusive? Explain why or why not?

(ii) A speculator is thinking about investing Rs. 10000 in a company's stock. She believes there is 0.8 probability of a takeover. If there is a takeover, the stock she purchased would be worth Rs. 30000. If there is no takeover, the stock becomes completely worthless, and she will lose her money. What is her expected profit for purchasing this stock? Should she make the investment based on the expected value?

(iii) A manufacturing unit of an automobile company published the result of a study in which each car was subjected to some kind of test and graded on a scale from 15 to 75. The scores of the 21 car in the study were 27 35 65 67 47 46 63 44 34 51 17 40 41 60 24 48 29 73 60 41 47

- Prepare frequency distribution of the scores of the cars with ten classes.

[Turn over

- II. Compute the sample mean.
- III. Compute the median and the mode.
- IV. Prepare an ogive for the data.
- V. Compute the Q_1 and Q_3 scores.

[10+5+10]

In a class project (Variance in compressive strength of fly ash Supplemented Concrete, 1996), W. Beard explored the effects of various amounts of fly ash in high-strength concrete. Data found in ACI Materials Journal gave the compressive strength of 28 day old samples of 4000 psi specified strength concrete using from 0 to 60% high calcium fly ash (class C)

Percent fly ash					
0	20	30	40	50	60
4799	5189	5110	5995	5746	4895
4706	5140	5685	5628	5719	5030
4350	4976	5618	5897	5782	4648

Test the hypothesis at the 0.01 level that the population mean strengths are the same for the 6 amounts of fly ash (Required distribution value from table 4.86). [25]

Manager of a bank decided to reward their employees depending on the number of customers they have handled daily. The data of 3 employees are presented below. Compare their performances using ANOVA test. (Critical F value=3.68) [25]

EMPLOYEE 1	EMPLOYEE 2	EMPLOYEE 3
45	55	54
56	50	61
47	53	54
51	59	58
50	58	52
45	49	51

5. Patrick Madigan examined the relation between systolic and diastolic blood pressure and heart recovery rate. Each person in the experiment exercised on a stationary bike until they reached 65 percent of their maximum heart rate. Then the time (sec) for each to recover their normal rate was observed (data = recovery)

Gender	Systolic	Diastolic	Recovery
M	118	82	183
M	110	70	140
M	118	80	451
F	116	70	131
M	126	68	149
F	112	62	154
F	124	70	183
F	108	62	135
M	122	82	384

Assume the populations involved are normally distributed. For systolic and diastolic blood pressure and heart recovery rate, test the hypothesis at 0.05 level that the population variances for females and males are equal. (F=9.98 for systolic BP and F=15.10 for diastolic). [25]