

B.Tech. Degree III Semester Examination in Polymer Science and Rubber Technology, November 2007

PTF 1301 APPLIED STATISTICS (New Scheme)

Time : 3 Hours

Maximum Marks : 100

PART A

(All questions carry EQUAL marks)

(5 x 5 = 25)

- I
- a) Define arithmetic mean state any two properties of it.
 - b) Explain the Principle of Least Squares.
 - c) State addition theorem of probability. If $P(A) = P_1$ and $P(A \cap B) = p_2$, $P(A \cup B) = p_3$, then find $P(B)$.
 - d) Define mathematical expectation of probability. Find $E[X]$ if $f(x) = K(1-x)$, $0 < x < 1$ is the pdf of a continuous random variable.
 - e) Derive the sampling distribution of mean of samples taken from a normal population.
 - f) Write a note on RBD.
 - g) What do you mean by acceptance sampling plan?

PART B

- II
- a) Calculate the median for the following data

Classes	:	0-10	10-20	20-30	30-40	40-50	50-60	
Frequency	:	4	5	10	12	3	1	(7)
 - b) Fit a straight line of the form $y = ax + b$ to the following data:

x	:	6	7	7	8	8	8	9	9	10	
y	:	5	5	4	5	4	3	4	3	3	(8)
- OR
- III
- a) Calculate the correlation coefficient to the data given below:

x	:	10	14	18	22	26	30	
y	:	18	12	24	6	30	36	(7)
 - b) Calculate the quartile coefficient of skewness of the following distribution:

Class	:	1-5	6-10	11-15	16-20	21-25	26-30	31-35	
Frequency	:	3	4	68	30	10	6	2	(8)
- IV
- a) Derive the mean and variance of binomial distribution. (8)
 - b) Show that binomial distribution tends to Poisson distribution when n is large and p is small such that np is finite. (7)
- OR
- V
- a) Derive the mgf of normal distribution. (8)
 - b) If x is a normal variate with mean 20 and S.D 5. Find the probability that
 - i) $16 \leq X \leq 22$
 - ii) $X \geq 23$
 - iii) $|X - 20| > 5$
 (7)
- VI
- a) Find the value of χ^2 for the following data:

Observed frequency	:	8	29	44	15	4	
Expected frequency	:	7	24	38	24	7	(7)
 - b) A random sample of size 16 has 53 as mean and sum of squares of deviation taken from mean is 150. Can this sample be regarded as taken from the population having 56 as mean (5% significance level) (8)

OR

(Turn Over)

- VII a) Two independent samples drawn from two normal populations are:
 Sample I : 20, 16, 26, 27, 23, 22, 18, 24, 25, 19
 Sample II : 27, 33, 42, 35, 32, 34, 38, 28, 41, 43, 30, 37
 Test whether the two population have same variance. (8)
- b) From a sample of 19 pairs of observations, the correlation is 0.5 and corresponding population value is 0.3. Is the difference significant. (7)

- VIII a) Explain the three principles of an experimental design. (7)
- b) The following table shows the lines in hours of four batches of electric lamps:
 Batches
- | | | | | | | | |
|---|------|------|------|------|------|------|-----------|
| 1 | 1600 | 1610 | 1650 | 1680 | 1700 | 1720 | 1800 |
| 2 | 1580 | 1640 | 1640 | 1700 | 1750 | | |
| 3 | 1460 | 1550 | 1600 | 1620 | 1640 | 1660 | 1740 1820 |
| 4 | 1510 | 1520 | 1530 | 1570 | 1600 | 1680 | |
- Perform an analysis of variance of one way classification to these data. (8)

OR

- IX a) Explain the analysis of variance in one way classification. (7)
- b) The following table gives quality rating of service stations by 5 professional raters:

Rater	Service Station									
	1	2	3	4	5	6	7	8	9	10
A	99	70	90	99	65	85	75	70	85	92
B	96	65	80	95	70	88	70	51	84	91
C	95	60	48	87	48	75	71	93	80	93
D	98	65	70	95	67	82	73	94	86	90
E	97	65	62	99	60	80	76	92	90	89

Analyse the data and discuss whether there is any significant differences between raters or between service stations. (8)

- X Construct a control chart for mean and range for the following data on the basis of fuses, samples of 5 being taken every hour. Comment on whether the production seems to be under control.
 $(A_2 = 0.58, D_3 = 0, D_4 = 2.11)$ (15)

Sample No.	Sample		Observation		
1	42	65	75	78	87
2	42	45	68	72	90
3	19	24	80	81	81
4	36	54	69	77	84
5	42	51	57	59	78
6	51	74	75	78	132
7	60	60	72	95	138
8	18	20	27	42	60
9	15	30	39	62	84
10	69	109	113	118	153
11	64	90	93	109	112
12	61	78	94	109	136

OR

- XI a) Explain the double sampling plan. (7)
- b) Distinguish between total quality control and company wide quality control. (8)