NEW

Part–III 3-Tier

2015

STATISTICS

(Honours)

PAPER—VII (Group–B)

(PRACTICAL)

Full Marks : 50

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Answer *all* questions.

1. Lives (in hours) of 15 electric lamps were observed as follows :

147, 217, 170, 129, 155, 136, 158, 185, 199, 148, 187, 161, 146, 201, 212.

Obtain maximum likelihood estimate and moment estimate of θ assuming that the life time has the density function

$f(x, \theta) = 2\theta x e^{-\theta x^2}$, $x > 0$, $\theta > 0$. 4+4

2. The following table shows the observed pollution indexes of air samples in two areas of a city.

Area A	*Area B*
2·92	1·84
1·88	0·94
5·35	4·26
3·81	3·18
4·69	3·44
4·86	3·69
5·81	4·95
5·55	4·47

(i) Test the hypothesis that the mean pollution indexes are the same for the two areas.

(ii) A closer examination of the records reveals that each line of the data actually represents readings on the same day : 2.92 and 1.84 are from day 1, and so forth. Does this affect the validity of the results obtained in (i) ? If so, reanalyze. 4+4

3. Let X be a random variable distributed as Bin (10, p), $0<p<1$.

(i) Construct the UMP test for testing $H_0 : p = 0{\cdot}25$ against $H_1 : p > 0{\cdot}25$ at level of significance 0·05 (approximately)

(ii) Compute the powers at p = 0·375, 0·500, 0·625, 0·750.

(iii) Suppose that we are interested in securing power at least 0.9 against the alternative p = 0.375. Determine the minimum sample size required.

(You may assure normality.)

5+4+4

4. Pulse rates were recorded for 16 men and 13 women. The results are shown below :

Males : 61, 73, 58, 64, 70, 64, 72, 60, 65, 80, 55, 72, 56, 56, 74, 65

Females : 83, 58, 70, 56, 76, 64, 80, 68, 78, 108, 76, 70, 97

Use a suitable distribution-free test procedure to examine whether the distribution of pulse rates differs for men and women. 5

5. Random samples of students were taken from five different schools and weight of each selected student was measured in kg. Estimates of variances of weights are given in the table :

School	: 1	2	3	4	5
Number of students	: 15	12	10	18	8
Variance-Estimate	: 40	64	36	52	81

Judge whether the variances of weight (kg.) of students differ significantly from school to school by a large sample test with a suitable transformation of the statistic(s). 6

5. Practical Note Book and Viva Voce. 5+5

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1. The following 2^3 experiment in 3 replicates of two blocks each was conducted to compare the effect of poultry manures (M) with that of equivalent sulphate of ammonia (N) and super phosphate (P) on the yield of cabbages. Identify the confounded effect and carry out the complete analysis : 12

	Block 1				Block 2			
Replicate I	np	nm	pm	(l)	n	m	p	npm
	49	59	46	39	40	62	33	55
Replicate II	nm	(l)	pm	np	p	npm	m	n
	50	40	52	50	32	48	52	54
Replicate III	n	p	npm	m	pm	nm	(l)	np
	50	40	52	50	32	48	52	54

2. Glucose measurements (y) were made at four different times (x) on three individuals (A, B, C) as follows

A		B		C	
x	y	x	y	x	y
0·5	117	0·5	122	0·5	115
1·0	110	1·0	120	1·0	114
2·0	95	2·0	101	2·0	94
3·0	85	3·0	92	3·0	85
4·0	74	4·0	84	4·0	72
6·0	66	6·0	70	6·0	68

Test whether the regression lines for three individuals are parallel or not.

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3. A random sample of 2 households was drawn from a small colony of 5 households having monthly expenditure (in rupees) as follows :

Household	A	B	C	D	E
Expenditure (in Rs.)	1520	1480	1560	1464	1550

(a) Calculate population mean and population variance.

(b) Obtain all possible sample of size 2 by replacement method and show that sample mean and sample variance gives an unbiased estimate of the population mean and population variance.

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4. A sample survey was conducted in a contain district of Himachal Pradesh to estimate the number of apple orchards. Four strata of villages were formed according to area of production. A random sample of villages was selected from each stratum and the number of apple orchards in each selected village was noted. The data are given below :

Stratum	Total Number of villages	Number of villages in sample	Number of orchards in the selected villages
I	280	10	2,5,7,0,9,6,0,5,8,4
II	145	8	25,30,21,12,8,18,5,6
III	92	12	45,37,4,10,37,6,12,17,32,10,7,9
IV	65	7	32,45,22,37,31,65,16

(a) Estimate the number of orchards in the district and also the standard error of the estimate.

(b) Obtain the estimated gain due to stratification over simple random sampling.

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5. Practical Note-Book and Viva-Voce. 5+5
