Second Semester M.Sc. Degree Examination, July 2013

Statistics

Paper 2.5 – Practical I

Time: Three Hours Maximum Marks: 40

Answer three questions without omitting any part

Part A: Inference I (Estimation)

1 (a) A random sample of size 12 is drawn from a uniform distribution with parameter θ.
The observations are
2.4, 5.6, 2.8, 3.4, 3.7, 2.9, 1.7, 2.8, 4.1, 4.6, 6.2, 3.4
Obtain (i) MLE, moment estimator and UMVUE of θ
(ii) 90% shortest confidence interval for θ **(3+2 =5)**

(b) Obtain 95% unbiased confidence interval. based on the following random samples drawn from two normal populations with common variance

Population I: 32, 45, 29, 41, 38, 34
Population II: 43, 53, 52, 48, 35, 37, 46, 48, 36, 32 **(3)**

(c) Obtain the (i) MVBE and (ii) UMVUE of σ^2 based on the random sample 12, 8, 14, 10, 11, 6, 9, 5 from N $(0, \sigma^2)$. **(3)**

(d) Compute 95% confidence limits for the parameter θ of exponential distribution with mean $1/\theta$ of based on a large sample of 900 observations with mean 2 **(3)**

2 (a) Obtain the moment estimators of α and β of gamma distribution with mean α/β based on the following random observations

24, 32, 36, 28, 25, 31, 32, 34, 28, 36 **(5)**

(b) A random sample of size 10 is drawn from an exponential distribution with mean λ. The observations are

18, 15, 21, 14, 20, 16, 21, 13, 18, 22

Obtain (i) UMVUE , (ii) MLE and (iii) 95% shortest confidence interval of λ **(6)**

(c) Obtain the 95% unbiased confidence interval for the parameter μ in N (μ, σ^2) based on the random sample
70, 120, 110, 101, 88, 83, 95, 98, 107, 100 **(3)**

Part B: Design of Experiments

3 (a) . An experiment was conducted on five different varieties of wheat and yield per plot in kg are given below. Test whether the varieties of wheat differ significantly or not

Varieties	Observations
V_1	320 420 353 331 358 400
V_2	372 455 375 328 308
V_3	350 437 420 382 280 272
V_4	360 340 375 390 395
V_5	258 298 336 430

(b) Analyse the following LSD

A(184.8)	D(327.8)	C(161.8)	B(258.8)	E(318.9)
B(269)	E(327.7)	A(164.4)	C(154.8)	D(321.7)
D(286.9)	B(247.6)	E(171.3)	A(200.2)	C(153.3)
C(301.6)	A(209.1)	D(193.2)	E(276.6)	B(293.8)
E(285.3)	C(258.6)	B(306.7)	D(179.2)	A(313.6)

(c) Analyse the following factorial experiment

Blocks I: (n) 45 (p)55 (k)53 (npk)36 (nk) 41 (pk)48 (np)55 (1)42
Block II: (k)50 (nk)44 (np)43 (1)61 (p)44 (npk)58 (n)41 (pk)50
Block III: (npk)43 (nk)42 (1)39 (p)34 (np)47 (k)52 (pk)50 (n)44
Block IV: (1)43 (n)52 (k)57 (nk)39 (p)56 (np)54 (pk)52 (npk)42

4.(a) The data below shows yield of paddy in kg on five treatments. Test the hypothesis that the mean yields are same.

Treatments	Yield in kg
T_1	16.5 17.7 16.5 17.4 16.9 17.9 17.2 17.5 17.1 16.5
T_2	18.9 17.6 18.2 17.9 18.4 18.5 18.6 17.7
T_3	18.5 16.5 17.7 22.4 20.8 21.5 21.2 21.1 17.5 18.5, 16.6
T_4	18.5, 19.3 18.8 21.4 20.7 20.2 20.4
T_5	18.7 18.9 18.2 17.8 17.4 18.9 18.3 18.3 18.6

(b). Following is the results of an experiment involving six treatments in four randomized blocks. Test whether the treatments differ significantly.

Blocks	Treatments and yield
I	A(40.4) C(42.4) B(38.7) D(39.6) E(46.4), F(35.4)
II	C(42.7) B(48.4) A(39) D(42.3) F(45.8) E(34.3)
III	F(42.1) D(39.8) A(38.5) C(47.9) B(50.4) E(30.8)
IV	E(39.4) B(40.6) A(32.4) D(36.6) C(47.3) F(39.1)

(c). The data below gives the breaking strength of fibre produced by three machines from a textile company. It was found that breaking strength is related to its diameter.

X: diameter in 10^{-3} inches, Y: strength in pounds

Machines	X	Y	X	Y	X	Y	X	Y	X	Y
I	20	36	26	41	24	39	25	42	32	49
II	22	40	28	48	22	39	30	45	28	44
III	21	35	23	37	26	42	21	34	15	32

Analyze the data and state your conclusions.

Part C: Sampling Techniques

5 Given the number of standards of pepper in 15 clusters of four fields each selected by SRSWOR out of 25 clusters. Estimate the average number of standards per field along with its standard error.

Cluster	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	22	53	43	50	73	65	71	24	21	36	72	68	59	43	76
2	18	47	29	47	62	71	75	49	72	43	49	64	72	35	58
3	27	38	37	41	58	69	31	43	47	51	56	76	67	71	47
4	28	29	47	51	47	59	21	75	72	39	69	57	76	40	34

6 The number of labors X (in thousands) and the quantity of raw materials (in lakhs) are given below for 20 mills. Draw a sample of 5 units by SRSWOR. Compute the ratio estimate along with their variance. Also compare the variances of estimate of mean per unit.

No	X	Y	No	X	Y
1	368	31	11	512	31
2	384	33	12	503	29
3	361	37	13	472	38
4	347	39	14	429	41
5	403	43	15	367	40
6	529	61	16	376	38
7	703	68	17	412	42
8	396	42	18	345	45
9	473	41	19	297	32
10	509	49	20	633	50