RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2015

SECOND YEAR

Date : 30/05/2015 **STATISTICS (General)**

Time : 10.30 am – 11.30 am **Paper :** IV Full Marks : 25

(Use a separate Answer Book for each group)

Group – A

1. Answer **any three** questions of the following : (3 × 5)
   a) Explain the concept of random number tables. Using a random number table, describe a method of selecting a simple random sample of size 5 from a population of 137 units, without replacement.
   b) Explain the two types of error in Sample Survey. Discuss the different sources of Non-sampling error.
   c) In simple random sampling with replacement, give an unbiased estimator of population proportion and find the standard error of the estimator.
   d) What is the purpose of stratification in sampling? In stratified random sampling, give an unbiased estimator of population mean and find the variance of the estimator.

Group – B

2. Answer **any one** question of the following : (1 × 10)
   a) Describe the technique of ANOVA in 2-way classified data, stating clearly the assumptions you make. Provide the ANOVA table as well. (Assume 'm' observations per cell).
   b) A neuro-psychologist was interested in how monkeys learn to perform a task. The task was to retrieve a coconut from the opposite side of a river. 15 wild monkeys were assigned to one of the three conditions :
      i) Observing a monkey (they watched another monkey retrieve the coconut by building a bridge across the stream)
      ii) Observing a human being (they watched the human solve the task)
      iii) Banana reward (they were allowed to do what they wanted but every time they engaged in behaviour that facilitated solving the task, they were rewarded with a banana).

   After learning, the monkeys were required to solve the problem again & the time taken to solve the problem was measured. The figures are shown below:

Banana reward	Observing monkey	Observing human
1	7	15
1	15	8
7	1	13
13	8	13
13	9	6

   Carry out the appropriate ANOVA to test at 5% level of significance the hypothesis that some forms of learning are more successful than others.

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TABLE V *F*-DISTRIBUTION*

Values of $F_{05 : \nu_1, \nu_2}$

ν_2 \ ν_1	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161·4	199·5	215·7	224·6	230·2	234·0	236·8	238·9	240·5	241·9	243·9	245·9	248·0	249·1	250·1	251·1	252·2	253·3	254·3
2	18·51	19·00	19·16	19·25	19·30	19·33	19·35	19·37	19·38	19·40	19·41	19·43	19·45	19·45	19·46	19·47	19·48	19·49	19·50
3	10·13	9·55	9·28	9·12	9·01	8·94	8·89	8·85	8·81	8·79	8·74	8·70	8·66	8·64	8·62	8·59	8·57	8·55	8·53
4	7·71	6·94	6·59	6·39	6·26	6·16	6·09	6·04	6·00	5·96	5·91	5·86	5·80	5·77	5·75	5·72	5·69	5·66	5·63
5	6·61	5·79	5·41	5·19	5·05	4·95	4·88	4·82	4·77	4·74	4·68	4·62	4·56	4·53	4·50	4·46	4·43	4·40	4·36
6	5·99	5·14	4·76	4·53	4·39	4·28	4·21	4·15	4·10	4·06	4·00	3·94	3·87	3·84	3·81	3·77	3·74	3·70	3·67
7	5·59	4·74	4·35	4·12	3·97	3·87	3·79	3·73	3·68	3·64	3·57	3·51	3·44	3·41	3·38	3·34	3·30	3·27	3·23
8	5·32	4·46	4·07	3·84	3·69	3·58	3·50	3·44	3·39	3·35	3·28	3·22	3·15	3·12	3·08	3·04	3·01	2·97	2·93
9	5·12	4·26	3·86	3·63	3·48	3·37	3·29	3·23	3·18	3·14	3·07	3·01	2·94	2·90	2·86	2·83	2·79	2·75	2·71
10	4·96	4·10	3·71	3·48	3·33	3·22	3·14	3·07	3·02	2·98	2·91	2·85	2·77	2·74	2·70	2·66	2·62	2·58	2·54
11	4·84	3·98	3·59	3·36	3·20	3·09	3·01	2·95	2·90	2·85	2·79	2·72	2·65	2·61	2·57	2·53	2·49	2·45	2·40
12	4·75	3·89	3·49	3·26	3·11	3·00	2·91	2·85	2·80	2·75	2·69	2·62	2·54	2·51	2·47	2·43	2·38	2·34	2·30
13	4·67	3·81	3·41	3·18	3·03	2·92	2·83	2·77	2·71	2·67	2·60	2·53	2·46	2·42	2·38	2·34	2·30	2·25	2·21
14	4·60	3·74	3·34	3·11	2·96	2·85	2·76	2·70	2·65	2·60	2·53	2·46	2·39	2·35	2·31	2·27	2·22	2·18	2·13
15	4·54	3·68	3·29	3·06	2·90	2·79	2·71	2·64	2·59	2·54	2·48	2·40	2·33	2·29	2·25	2·20	2·16	2·11	2·07
16	4·49	3·63	3·24	3·01	2·85	2·74	2·66	2·59	2·54	2·49	2·42	2·35	2·28	2·24	2·19	2·15	2·11	2·06	2·01
17	4·45	3·59	3·20	2·96	2·81	2·70	2·61	2·55	2·49	2·45	2·38	2·31	2·23	2·19	2·15	2·10	2·06	2·01	1·96
18	4·41	3·55	3·16	2·93	2·77	2·66	2·58	2·51	2·46	2·41	2·34	2·27	2·19	2·15	2·11	2·06	2·02	1·97	1·92
19	4·38	3·52	3·13	2·90	2·74	2·63	2·54	2·48	2·42	2·38	2·31	2·23	2·16	2·11	2·07	2·03	1·98	1·93	1·88
20	4·35	3·49	3·10	2·87	2·71	2·60	2·51	2·45	2·39	2·35	2·28	2·20	2·12	2·08	2·04	1·99	1·95	1·90	1·84
22	4·30	3·44	3·05	2·82	2·66	2·55	2·46	2·40	2·34	2·30	2·23	2·15	2·07	2·03	1·98	1·94	1·89	1·84	1·78
24	4·26	3·40	3·01	2·78	2·62	2·51	2·42	2·36	2·30	2·25	2·18	2·11	2·03	1·98	1·94	1·89	1·84	1·79	1·73
26	4·23	3·37	2·98	2·74	2·59	2·47	2·39	2·32	2·27	2·22	2·15	2·07	1·99	1·95	1·90	1·85	1·80	1·75	1·69
28	4·20	3·34	2·95	2·71	2·56	2·45	2·36	2·29	2·24	2·19	2·12	2·04	1·96	1·91	1·87	1·82	1·77	1·71	1·65
30	4·17	3·32	2·92	2·69	2·53	2·42	2·33	2·27	2·21	2·16	2·09	2·01	1·93	1·89	1·84	1·79	1·74	1·68	1·62
40	4·08	3·23	2·84	2·61	2·45	2·34	2·25	2·18	2·12	2·08	2·00	1·92	1·84	1·79	1·74	1·69	1·64	1·58	1·51
60	4·00	3·15	2·76	2·53	2·37	2·25	2·17	2·10	2·04	1·99	1·92	1·84	1·75	1·70	1·65	1·59	1·53	1·47	1·39
120	3·92	3·07	2·68	2·45	2·29	2·17	2·09	2·02	1·96	1·91	1·83	1·75	1·66	1·61	1·55	1·50	1·43	1·35	1·25
∞	3·84	3·00	2·60	2·37	2·21	2·10	2·01	1·94	1·88	1·83	1·75	1·67	1·57	1·52	1·46	1·39	1·32	1·22	1·00

For other values of ν_1 and ν_2, one may use linear interpolation, taking $1/\nu_1$ and $1/\nu_2$ as the independent variables.

TABLE VI
RANDOM SAMPLING NUMBERS *

4652	3819	8431	2150	2352	2472	0043	3488
9031	7617	1220	4129	7148	1943	4890	1749
2030	2327	7353	6007	9410	9179	2722	8445
0641	1489	0828	0385	8488	0422	7209	4950
8479	6062	5593	6322	9439	4996	1322	4918
9917	3490	5533	2577	4348	0971	2580	1943
6376	9899	9259	5117	1336	0146	0680	4052
7287	0983	3236	3252	0277	8001	6058	4501
0592	4912	3457	8773	5146	2519	3931	6794
6499	9118	3711	8838	0691	1425	7768	9544
0769	1109	7909	4528	8772	1876	2113	4781
8678	4873	2061	1835	0954	5026	2967	6560
0178	7794	6488	7364	4094	1649	2284	7753
3392	0963	6364	5762	0322	2592	3452	9002
0264	6009	1311	5873	5926	8597	9051	8995
4089	7732	8163	2798	1984	1292	0041	2500
9376	7365	7987	1937	2251	3411	6737	0367
3039	3780	2137	7641	4030	1604	2517	9211
8971	8653	1855	5285	5631	2649	6696	5475
0373	4153	5199	5765	2067	6627	3100	5716
9092	4773	0002	7000	7800	2292	2933	6125
2464	1038	3163	3569	7155	2029	2538	7080
3027	6215	3125	5856	9543	3660	0255	5544
5754	9247	1164	3283	1865	5274	5471	1346
4358	3716	6949	8502	1573	5763	5046	7135
7178	8324	8379	7365	4577	4864	0629	5100
5035	5939	3665	2160	6700	7249	1738	2721
3318	0220	3611	9887	4608	8664	2185	7290
9058	1735	7435	6822	6622	8286	8901	5534
7886	5182	7595	0305	4903	3306	8088	3899
3354	8454	7386	1333	5345	6565	3159	3991
3415	7671	0846	7100	1790	9449	6285	2525
3918	5872	7898	6125	2268	1898	0755	6034
6138	9045	6950	8843	6533	0917	6673	5721
3825	1704	2835	4677	4637	7329	3156	3291
1349	0417	9311	9787	1284	0769	8422	1077
4234	0248	7760	6504	2754	4044	0842	9080
6880	3201	7044	3657	5263	0374	7563	6599
0714	5008	5076	1134	5342	1608	5179	0967
3448	6421	3304	0583	1260	0662	7257	0766
5711	7343	7539	3684	9397	5335	4031	1486
2588	3301	0553	2427	3598	2580	7017	9176
8581	4253	7404	5264	5411	3431	3092	8573
8475	6322	3949	9675	6533	1133	8776	2216
0272	5624	8549	5552	7469	2799	2822	9620
7383	7795	7939	2652	4456	6993	2950	8573
5126	2089	7729	0945	3901	4445	7117	8186
2064	3760	0939	7319	5939	3432	2030	4752
9315	8185	7805	6294	7072	6491	4012	1016
6814	8752	3462	6001	3302	3895	7371	3432

TABLE VI (Contd.)

4433	0247	9747	0412	3893	2503	2972	4154
9193	7314	1501	4702	7030	9601	0630	3727
4246	0693	6041	0931	2952	4968	8239	7729
6974	1051	8966	5157	2154	9558	7646	3043
5673	1602	8741	0513	8713	6108	7329	7698
7370	7319	4104	6025	4209	5042	4501	7824
6934	0165	3319	6222	4129	6524	4322	9422
1592	6953	7868	5874	0805	1138	9428	0189
4683	7249	1998	0956	8325	4001	2261	8844
4206	3295	1732	6780	8409	6957	5292	5041
5885	3316	1187	1217	3912	1107	7220	0035
2584	4222	9438	9652	0338	9712	8715	9587
1275	5976	4273	4895	5751	3112	5082	6050
6801	1709	0038	1231	5222	2473	8909	9970
6853	9282	1196	0347	3135	5902	2384	7929
3210	4345	4448	0229	0371	8269	4448	3348
1684	5742	1897	2503	1656	5702	4613	4108
2391	2897	3406	4844	8756	8011	0246	3663
2543	3913	1429	6379	3369	9040	5983	0436
6793	5986	8153	0769	3347	4014	7007	9018
8118	4646	9668	3408	8878	3534	5549	6929
4970	2717	9943	1136	9504	0519	5240	0991
4496	1109	8238	9173	6244	7230	0991	1463
9022	5050	5383	9582	1326	2516	5589	4051
4816	1007	1067	2866	7916	2674	5578	1675
8897	4869	3221	3266	3567	3365	3675	2195
4234	7491	8194	5072	6555	0799	1940	1232
6933	5786	6675	7853	8325	9408	3252	6799
0502	3633	7793	1529	4067	5459	8641	3247
6440	9450	8896	1441	7718	4849	3192	5958
1248	0405	4572	6861	3737	9558	1025	8707
3110	1168	6046	5837	6243	6745	2362	7710
8822	3604	7844	2085	7923	7979	0648	9003
8680	1201	2536	0308	8733	9722	4556	4684
5327	1250	9502	0340	9894	0438	2677	9200
3798	0805	8037	7474	0516	8715	8398	5552
2688	7601	3408	6525	2710	4547	9156	1623
8552	8348	7934	1530	3523	6882	4334	7237
8713	5638	7620	3148	4508	3123	4023	4560
2104	4716	7582	4576	8105	7527	9082	2426
6503	8499	3100	2209	3406	6314	6910	8051
0085	0711	9557	8428	4332	9685	6492	7422
3822	3407	5603	5431	0083	7074	6929	7054
2193	9184	4815	0566	1214	8483	2282	0916
5392	1390	7100	4578	5107	7946	4502	2765
4635	6166	3085	4297	8619	0912	6917	5364
0495	3715	6053	1723	0114	8257	4650	9901
3296	3067	3040	0852	2939	4015	6927	7710
1348	5573	7270	6840	7450	5933	6472	3750
3132	2603	5574	1528	8104	5520	7279	7940

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