PGDM, Batch-2014-16
Statistics for Business Analysis
DM-107
Trimester – I, End-Term Examination: September 2014

Time allowed: 2.5 Hours — Max Marks: 50

Roll No: ____________

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means.** In case of rough work please use answer sheet.

Section-A

Attempt any 3 out of 5 Short Questions, each question carries equal marks. (3*5 = 15 Marks)

Q.A1: In a FindLaw.com survey, individuals were asked, "How closely do you read a contract for a credit card?" The findings were that 44% read every word, 33% read enough to understand the contract, 11% just glance at it, and 4% don't read it at all.

a. For a sample of 500 people, how many would you expect to say that they read every word of a credit card contract?

b. For a sample of 500 people, what is the probability that 200 or fewer will say they read every word of a credit card contract?

Q.A2: What is the purpose of Chi square Test of Independence? What are the major assumptions of this Chi square test? What is the Chi Square Goodness of Fit test?

Q.A3: According to The Wirthlin Report, 24% of all workers say that their job is very stressful. If 60 workers are randomly selected, what is the probability that between 8 and 12 (inclusive) say that their job is very stressful?

Q.A4: A manufacturing company produces valves in various sizes and shapes. One particular valve plate is supposed to have a tensile strength of 5 lbs/mm. The company tests a random sample of 42 such valve plates from a lot of 650 valve plates. The sample mean is a tensile strength of 5.0611 lbs/mm, and the population standard deviation is .2803 lbs/mm. use α = .10 and test to determine whether the lot of valve plates has an average tensile strength of 5 lbs/mm.

Q A5: 1. What are the chief characteristics of normal distribution? What do you understand by z-score?

2. What are the types of sampling? Enumerate the various methods of probability sampling. What is sampling error?

Section-B

Attempt any 2 out of 3 Short Questions, each question carries equal marks. (2*10 = 20 Marks)

Q B1: Retailers such as Guess, Staples, Sports Authority, and Limited Brands are employing new technology to crack down on "serial exchangers"— customers who abuse their return and exchange policies. For example, some customers buy an outfit, wear it once or twice, and then return it. Software called *Verify-1*, a product of a California-based company Return Exchange, tracks a shopper's record of bringing back items. The historical return rate for merchandise at department stores is 13.0 percent. At one department store, after implementing the new software, there were 22 returns in a sample of 250 purchases. At $\alpha = .05$, does this sample prove that the true return rate has fallen?

Q B2: That the starting salaries of new accounting graduates would differ according to geographic regions of the United States seems logical. A random selection of accounting firms is taken from three geographic regions, and each is asked to state the starting salary for a new accounting graduate who is going to work in auditing. The data obtained follow. Use the appropriate technique to analyze these data. Note that the data can be restated to make the computations more reasonable (example: $42,500=4.25). Use a 1% level of significance. Discuss the business implications of your findings.

South	Northeast	West
$40,500	$51,000	$45,500
41,500	49,500	43,500
40,000	49,000	45,000
41,000	48,000	46,500
41,500	49,500	46,000

Q B3: Older people often have a hard time finding work. AARP reported on the number of weeks it takes a worker aged 55 plus to find a job. The data on number of weeks spent searching for a job contained in the file JobSearch are consistent with the AARP findings (*AARP Bulletin,* April 2008).

a) Provide a point estimate of the population mean number of weeks it takes a worker aged 55 plus to find a job.
b) At 95% confidence, what is the margin of error?
c) What is the 95% confidence interval estimate of the mean?

Section-C

Compulsory Case Study (15 Marks)

Wageweb conducts surveys of salary data and presents summaries on its Web site. Based on salary data as of October 1, 2002, Wageweb reported that the average annual salary for sales vice presidents was $142,111, with an average annual bonus of $15,432. Assume the following data are a sample of the annual salary and bonus for 10 sales vice presidents. Data are in thousands of dollars.

Vice	Salary	Bonus
1	135	12
2	115	14
3	146	16
4	167	19
5	165	22
6	176	24
7	98	7
8	136	17
9	163	18
10	119	11

a. Develop a scatter diagram for these data with salary as the independent variable.

b. What does the scatter diagram developed in part (a) indicate about the relationship between salary and bonus?

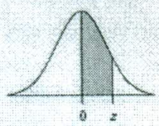
c. Use the least squares method to develop the estimated regression equation.

d. Provide an interpretation for the slope of the estimated regression equation.

e. Predict the bonus for a vice president with an annual salary of $120,000.

APPENDIX C-1

STANDARD NORMAL AREAS



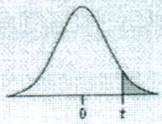
Example: $P(0 < z < 1.96) = .4750$

This table shows the normal area between 0 and z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.49865	.49869	.49874	.49878	.49882	.49886	.49889	.49893	.49896	.49900
3.1	.49903	.49906	.49910	.49913	.49916	.49918	.49921	.49924	.49926	.49929
3.2	.49931	.49934	.49936	.49938	.49940	.49942	.49944	.49946	.49948	.49950
3.3	.49952	.49953	.49955	.49957	.49958	.49960	.49961	.49962	.49964	.49965
3.4	.49966	.49968	.49969	.49970	.49971	.49972	.49973	.49974	.49975	.49976
3.5	.49977	.49978	.49978	.49979	.49980	.49981	.49981	.49982	.49983	.49983
3.6	.49984	.49985	.49985	.49986	.49986	.49987	.49987	.49988	.49988	.49989
3.7	.49989	.49990	.49990	.49990	.49991	.49991	.49992	.49992	.49992	.49992

APPENDIX D

STUDENT'S *t* CRITICAL VALUES



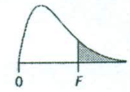
This table shows the *t*-value that defines the area for the stated degrees of freedom (ν).

	Confidence Level				
	.80	.90	.95	.98	.99
	Significance Level for Two-Tailed Test				
	.20	.10	.05	.02	.01
	Significance Level for One-Tailed Test				
ν	.10	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.656
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
31	1.309	1.696	2.040	2.453	2.744
32	1.309	1.694	2.037	2.449	2.738
33	1.308	1.692	2.035	2.445	2.733
34	1.307	1.691	2.032	2.441	2.728
35	1.306	1.690	2.030	2.438	2.724

	Confidence Level				
	.80	.90	.95	.98	.99
	Significance Level for Two-Tailed Test				
	.20	.10	.05	.02	.01
	Significance Level for One-Tailed Test				
ν	.10	.05	.025	.01	.005
36	1.306	1.688	2.028	2.434	2.719
37	1.305	1.687	2.026	2.431	2.715
38	1.304	1.686	2.024	2.429	2.712
39	1.304	1.685	2.023	2.426	2.708
40	1.303	1.684	2.021	2.423	2.704
41	1.303	1.683	2.020	2.421	2.701
42	1.302	1.682	2.018	2.418	2.698
43	1.302	1.681	2.017	2.416	2.695
44	1.301	1.680	2.015	2.414	2.692
45	1.301	1.679	2.014	2.412	2.690
46	1.300	1.679	2.013	2.410	2.687
47	1.300	1.678	2.012	2.408	2.685
48	1.299	1.677	2.011	2.407	2.682
49	1.299	1.677	2.010	2.405	2.680
50	1.299	1.676	2.009	2.403	2.678
55	1.297	1.673	2.004	2.396	2.668
60	1.296	1.671	2.000	2.390	2.660
65	1.295	1.669	1.997	2.385	2.654
70	1.294	1.667	1.994	2.381	2.648
75	1.293	1.665	1.992	2.377	2.643
80	1.292	1.664	1.990	2.374	2.639
85	1.292	1.663	1.988	2.371	2.635
90	1.291	1.662	1.987	2.368	2.632
95	1.291	1.661	1.985	2.366	2.629
100	1.290	1.660	1.984	2.364	2.626
110	1.289	1.659	1.982	2.361	2.621
120	1.289	1.658	1.980	2.358	2.617
130	1.288	1.657	1.978	2.355	2.614
140	1.288	1.656	1.977	2.353	2.611
150	1.287	1.655	1.976	2.351	2.609
∞	1.282	1.645	1.960	2.326	2.576

Note: As *n* increases, critical values of Student's *t* approach the *z*-values in the last line of this table. A common rule of thumb is to use *z* when $n > 30$, but that is *not* conservative.

CRITICAL VALUES OF $F_{.01}$



This table shows the 1 percent right-tail critical values of F for the stated degrees of freedom (ν).

Denominator Degrees of Freedom (ν_2)	Numerator Degrees of Freedom (ν_1)										
	1	2	3	4	5	6	7	8	9	10	12
1	4052	4999	5404	5624	5764	5859	5928	5981	6022	6056	6107
2	98.50	99.00	99.16	99.25	99.30	99.33	99.36	99.38	99.39	99.40	99.42
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.34	27.23	27.05
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55	14.37
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05	9.89
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.72
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.47
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.67
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.11
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.71
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.40
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.16
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.96
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.80
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.67
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.55
17	8.40	6.11	5.19	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.46
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.37
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.30
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37	3.23
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.17
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.12
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.07
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.03
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13	2.99
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18	3.09	2.96
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15	3.06	2.93
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12	3.03	2.90
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09	3.00	2.87
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.66
50	7.17	5.06	4.20	3.72	3.41	3.19	3.02	2.89	2.78	2.70	2.56
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34
200	6.76	4.71	3.88	3.41	3.11	2.89	2.73	2.60	2.50	2.41	2.27
∞	2.71	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32

Denominator Degrees of Freedom (ν_2)	Numerator Degrees of Freedom (ν_1)										
	15	20	25	30	35	40	50	60	120	200	∞
1	6157	6209	6240	6260	6275	6286	6302	6313	6340	6350	6366
2	99.43	99.45	99.46	99.47	99.47	99.48	99.48	99.48	99.49	99.49	99.50
3	26.87	26.69	26.58	26.50	26.45	26.41	26.35	26.32	26.22	26.18	26.13
4	14.20	14.02	13.91	13.84	13.79	13.75	13.69	13.65	13.56	13.52	13.47
5	9.72	9.55	9.45	9.38	9.33	9.29	9.24	9.20	9.11	9.08	9.02
6	7.56	7.40	7.30	7.23	7.18	7.14	7.09	7.06	6.97	6.93	6.88
7	6.31	6.16	6.06	5.99	5.94	5.91	5.86	5.82	5.74	5.70	5.65
8	5.52	5.36	5.26	5.20	5.15	5.12	5.07	5.03	4.95	4.91	4.86
9	4.96	4.81	4.71	4.65	4.60	4.57	4.52	4.48	4.40	4.36	4.31
10	4.56	4.41	4.31	4.25	4.20	4.17	4.12	4.08	4.00	3.96	3.91
11	4.25	4.10	4.01	3.94	3.89	3.86	3.81	3.78	3.69	3.66	3.60
12	4.01	3.86	3.76	3.70	3.65	3.62	3.57	3.54	3.45	3.41	3.36
13	3.82	3.66	3.57	3.51	3.46	3.43	3.38	3.34	3.25	3.22	3.17
14	3.66	3.51	3.41	3.35	3.30	3.27	3.22	3.18	3.09	3.06	3.01
15	3.52	3.37	3.28	3.21	3.17	3.13	3.08	3.05	2.96	2.92	2.87
16	3.41	3.26	3.16	3.10	3.05	3.02	2.97	2.93	2.84	2.81	2.76
17	3.31	3.16	3.07	3.00	2.96	2.92	2.87	2.83	2.75	2.71	2.66
18	3.23	3.08	2.98	2.92	2.87	2.84	2.78	2.75	2.66	2.62	2.57
19	3.15	3.00	2.91	2.84	2.80	2.76	2.71	2.67	2.58	2.55	2.49
20	3.09	2.94	2.84	2.78	2.73	2.69	2.64	2.61	2.52	2.48	2.42
21	3.03	2.88	2.79	2.72	2.67	2.64	2.58	2.55	2.46	2.42	2.36
22	2.98	2.83	2.73	2.67	2.62	2.58	2.53	2.50	2.40	2.36	2.31
23	2.93	2.78	2.69	2.62	2.57	2.54	2.48	2.45	2.35	2.32	2.26
24	2.89	2.74	2.64	2.58	2.53	2.49	2.44	2.40	2.31	2.27	2.21
25	2.85	2.70	2.60	2.54	2.49	2.45	2.40	2.36	2.27	2.23	2.17
26	2.81	2.66	2.57	2.50	2.45	2.42	2.36	2.33	2.23	2.19	2.13
27	2.78	2.63	2.54	2.47	2.42	2.38	2.33	2.29	2.20	2.16	2.10
28	2.75	2.60	2.51	2.44	2.39	2.35	2.30	2.26	2.17	2.13	2.07
29	2.73	2.57	2.48	2.41	2.36	2.33	2.27	2.23	2.14	2.10	2.04
30	2.70	2.55	2.45	2.39	2.34	2.30	2.25	2.21	2.11	2.07	2.01
40	2.52	2.37	2.27	2.20	2.15	2.11	2.06	2.02	1.92	1.87	1.81
50	2.42	2.27	2.17	2.10	2.05	2.01	1.95	1.91	1.80	1.76	1.69
60	2.35	2.20	2.10	2.03	1.98	1.94	1.88	1.84	1.73	1.68	1.60
120	2.19	2.03	1.93	1.86	1.81	1.76	1.70	1.66	1.53	1.48	1.38
200	2.13	1.97	1.87	1.79	1.74	1.69	1.63	1.58	1.45	1.39	1.28
∞	2.71	2.04	1.88	1.77	1.70	1.64	1.59	1.52	1.47	1.32	1.25

Some important Formulae

$$P(x) = \binom{n}{x} p^{x} q^{(n-x)} = \frac{n!}{x!(n-x)!} p^{x} q^{(n-x)} \quad ; \mu = np \quad ; \sigma^2 = npq$$

$$P(x) = \frac{\mu^{x} e^{-\mu}}{x!} \text{ for } x = 1,2,3,\ldots \quad ; \quad z = \frac{x-\mu}{\sigma}$$

$$\frac{\bar{X}-\mu}{\sigma/\sqrt{n}} \qquad \frac{\bar{X}-\mu}{s/\sqrt{n}} \qquad \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}}$$

$$\frac{\bar{X}-\mu_0}{\sigma/\sqrt{n}} \qquad \frac{\bar{X}-\mu_0}{s/\sqrt{n}} \qquad \frac{(\hat{p}-p_0)}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}} \qquad \_ \qquad = \qquad n = \frac{(z_{\alpha/2})^2 \sigma^2}{E^2}$$

Finite Correction Factor : ——— $\qquad N\bar{X} \pm N\left(t_{\alpha/2,n-1}\right)\frac{S}{\sqrt{n}}\sqrt{\frac{(N-n)}{(N-1)}}$

$SS(B) = \sum_{i=1}^{k} n_i (\bar{x}_i - \bar{\bar{x}})^2$ d.f. = k-1

$SS(W) = \sum_{i=1}^{k} df_i s_i^2$ d.f = n-k

SST = SSB + SSW d.f = n-1

$F_{(k-1,n-k \text{ at } \alpha)}$ = ———

$Y_i = b_0 + b_1 X$ $\qquad b_0 = \bar{y} - b_1 \bar{x}$

$$b_1 = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \qquad b_1 = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2}$$