

THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES DEGREE PROGRAMME
LEVEL 05 2007/2008
FINAL EXAMINATION 2008
QUANTITATIVE TECHNIQUES FOR MANAGEMENT II – MCU 3209



136

DATE : 09.02.2008

TIME : 1.30 p.m. – 4.30 p.m.

INSTRUCTIONS

Duration: Three Hours

ANSWER ANY FIVE (05) QUESTIONS.

All questions carry equal marks.

This question paper has seven questions.

Use of non-programmable calculators is allowed.

Normal and Chi-square tables are annexed herewith.

- (1) (a) Explain the key features of a Normal Distribution. Briefly explain the importance of Normal Distribution in statistical analysis.
- (b) A factory has 2000 employees. The arithmetic mean of the salaries of employees is Rs. 20,000/= and its standard deviation is Rs. 2,000/=. Assuming the salaries of the employees are Normally distributed, calculate;
- (i) The percentage of employees drawing a salary less than Rs. 20,000/=
- (ii) The number of employees will have a salary between Rs. 17,500/= and Rs. 25,000/=.
- (iii) Salary point of the employees earning the highest 10% of the salaries.
- (2) (a) Explain what is meant by a discrete probability distribution.
- (b) Explain and evaluate the expression ${}^n C_r p^r q^{(n-r)}$ when $n=5$, $r=3$ and $p=0.6$
- (c) The probability that a certain polythene bag can withstand 5kgs is 70%. What is the probability that more than 4 of the 6 bags can withstand a load of 5 kgs?
- (d) With the same polythene bags referred in (c) above, what is the probability that 80% of the bags could be successful in carrying a load of 5kgs in a pack of 100 bags?



- (3) (a) The probability that four customers use a certain telephone next hour is given by $e^{-5} 5^4 / 4!$. Explain this expression and evaluate the probability. ($e^1 = 2.718$)
- (b) The library has two books on statistics which can be borrowed for overnight use. It is observed that the demand for each book follows a Poisson Distribution with a mean value of 1.5.
- (i) Calculate the probability that both books are available on a given day.
- (ii) What is the probability the demand that has to be refused?
- (iii) What is the probability that some students could not borrow the book in a five day period?
- (c) One hundred shirts came from a manufacturing line is inspected for manufacturing defects and the data pertaining to the study is shown below.

No. of defects	0	1	2	3	4
No. of shirts	84	8	4	3	1

- (i) Fit Poisson distribution to the above data.
- (ii) What is the probability that there are more than 3 defects in a given shirt?
- (4) (a) Explain with suitable examples the components of time series data.
- (b) The percentage of quarterly centered moving averages of the quarterly sales of the past five years of a manufacturing organization are given below.

Year	Quarter			
	I	II	III	IV
2003	-	-	96	112
2004	103	94	99	114
2005	102	95	98	110
2006	104	96	100	112
2007	106	96	-	-

You are required to

- (i) Calculate the quarterly seasonal indexes.
- (ii) If the sales forecast for year 2008 is 10,000 units, estimate the quarterly sales for the year.

- (5) (a) Explain the differences between sample surveys and census surveys. Discuss the conditions that are undertaken in these data collection methods. What are the types of errors you may face with these data collection methods?
- (b) A producer of CFL bulbs claims that mean life of his bulbs is 3 years with standard deviation .5 years. A sample of 100 bulbs selected randomly and found their mean life is 3.2 years. Would you accept the claim of the manufacturer at 5% level of significance?
- (c) Two randomly selected samples of 100 bulbs produced in two plants were tested for their performances and their results are as follows.

	Mean life (Hrs.)	Standard deviation (Hrs.)
Plant A	11000	100
Plant B	10500	90

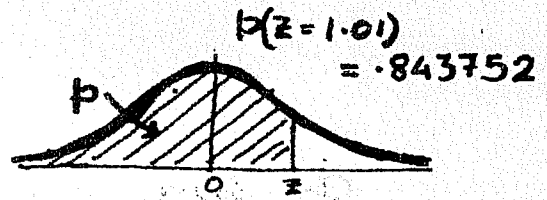
Is there a significant difference in the mean life of bulbs manufactured in two plants? (5% level of significance)

- (6) (a) Discuss the importance of "Chi-square" test in business. Explain how this test is used to test the association.
- (b) The training manager of a bank wants to study the effectiveness of his training programmes. Following data are gathered by him. You are required to assist him: (Use 5% level of significance)

Performance	Type of Training			Total
	Intensive	Moderate	Nominal	
Above average	100	150	50	300
Average	100	100	100	300
Poor	50	100	150	300

- (7) Write short notes on any four (04) of the following.
- (a) Sampling error and non-sampling error.
- (b) Approximations of Binomial and Poisson Distributions to Normal distribution.
- (c) Type II error and the power of the test
- (d) Null Hypothesis and Alternative Hypothesis.
- (e) One tail test and two tail test.

Standard normal distribution



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.500000	.503989	.507978	.511966	.515953	.519939	.523922	.527903	.531881	.535856
0.1	.539828	.543795	.547758	.551717	.555670	.559618	.563559	.567495	.571424	.575345
0.2	.579260	.583166	.587064	.590954	.594835	.598706	.602568	.606420	.610261	.614092
0.3	.617911	.621720	.625516	.629300	.633072	.636831	.640576	.644309	.648027	.651732
0.4	.655422	.659097	.662757	.666402	.670031	.673645	.677242	.680822	.684386	.687933
0.5	.691462	.694974	.698468	.701944	.705401	.708840	.712260	.715661	.719043	.722405
0.6	.725747	.729069	.732371	.735653	.738914	.742154	.745373	.748571	.751748	.754903
0.7	.758036	.761148	.764238	.767305	.770350	.773373	.776373	.779350	.782305	.785236
0.8	.788145	.791036	.793892	.796731	.799546	.802337	.805105	.807850	.810570	.813267
0.9	.815940	.818589	.821214	.823814	.826391	.828944	.831472	.833977	.836457	.838913
1.0	.841345	.843752	.846136	.848495	.850830	.853141	.855428	.857690	.859929	.862143
1.1	.864334	.866500	.868643	.870762	.872857	.874928	.876976	.879000	.881000	.882977
1.2	.884930	.886861	.888768	.890651	.892512	.894350	.896165	.897958	.899727	.901475
1.3	.903200	.904902	.906582	.908241	.909877	.911492	.913085	.914657	.916207	.917736
1.4	.919243	.920730	.922196	.923641	.925066	.926471	.927855	.929219	.930563	.931888
1.5	.933193	.934478	.935745	.936992	.938220	.939429	.940620	.941792	.942947	.944083
1.6	.945201	.946301	.947384	.948449	.949497	.950529	.951543	.952540	.953521	.954486
1.7	.955435	.956367	.957284	.958185	.959070	.959941	.960796	.961636	.962462	.963273
1.8	.964070	.964852	.965620	.966375	.967116	.967843	.968557	.969258	.969946	.970621
1.9	.971283	.971933	.972571	.973197	.973810	.974412	.975002	.975581	.976148	.976705
2.0	.977250	.977784	.978308	.978822	.979325	.979818	.980301	.980774	.981237	.981691
2.1	.982136	.982571	.982997	.983414	.983823	.984222	.984614	.984997	.985371	.985738
2.2	.986097	.986447	.986791	.987126	.987455	.987776	.988089	.988396	.988696	.988989
2.3	.989276	.989556	.989830	.990097	.990358	.990613	.990863	.991106	.991344	.991576
2.4	.991802	.992024	.992240	.992451	.992656	.992857	.993053	.993244	.993431	.993613
2.5	.993790	.993963	.994132	.994297	.994457	.994614	.994766	.994915	.995060	.995201
2.6	.995339	.995473	.995604	.995731	.995855	.995975	.996093	.996207	.996319	.996427
2.7	.996533	.996636	.996736	.996833	.996928	.997020	.997110	.997197	.997282	.997365
2.8	.997445	.997523	.997599	.997673	.997744	.997814	.997882	.997948	.998012	.998074
2.9	.998134	.998193	.998250	.998305	.998359	.998411	.998462	.998511	.998559	.998605

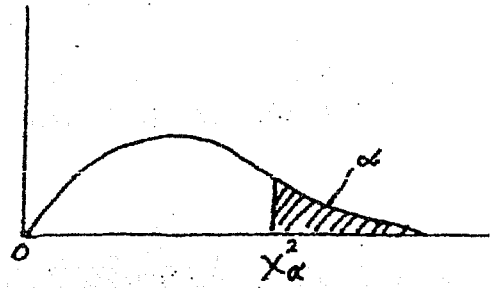
Some useful formula (in familiar notation)

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right) \left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}, \quad a = \bar{y} - b\bar{x}$$

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Chi-Square Table:
Values of χ^2_{α}



$\chi^2_{.10}$	$\chi^2_{.05}$	$\chi^2_{.025}$	$\chi^2_{.01}$	$\chi^2_{.005}$	<i>df</i>
2.70554	3.84146	5.02389	6.63490	7.87944	1
4.60517	5.99147	7.37776	9.21034	10.5966	2
6.25139	7.81473	9.34840	11.3449	12.8381	3
7.77944	9.48773	11.1433	13.2767	14.8602	4
9.23635	11.0705	12.8325	15.0863	16.7496	5
10.5446	12.5916	14.4494	16.8119	18.5476	6
12.0170	14.0671	16.0128	18.4753	20.2777	7
13.3616	15.5073	17.5346	20.0902	21.9550	8
14.6837	16.9190	19.0228	21.6660	23.5893	9
15.9871	18.3070	20.4831	23.2093	25.1882	10
17.2750	19.6751	21.9200	24.7250	26.7569	11
18.5494	21.0261	23.3367	26.2170	28.2995	12
19.8119	22.3621	24.7356	27.6883	29.8194	13
21.0642	23.6848	26.1190	29.1413	31.3193	14
22.3072	24.9958	27.4884	30.5779	32.8013	15
23.5418	26.2962	28.8454	31.9999	34.2672	16
24.7690	27.5871	30.1910	33.4087	35.7185	17
25.9894	28.8693	31.5264	34.8053	37.1564	18
27.2036	30.1435	32.8523	36.1908	38.5822	19
28.4120	31.4104	34.1696	37.5662	39.9968	20
29.6151	32.6705	35.4789	38.9321	41.4010	21
30.8133	33.9244	36.7807	40.2894	42.7956	22
32.0069	35.1725	38.0757	41.6384	44.1813	23
33.1963	36.4151	39.3641	42.9798	45.5585	24
34.3816	37.6525	40.6465	44.3141	46.9278	25
35.5631	38.8852	41.9232	45.6417	48.2899	26
36.7412	40.1133	43.1944	46.9630	49.6449	27
37.9159	41.3372	44.4607	48.2782	50.9933	28
39.0875	42.5569	45.7222	49.5879	52.3356	29
40.2560	43.7729	46.9792	50.8922	53.6720	30
51.8050	55.7585	59.3417	63.6907	66.7659	40
63.1671	67.5048	71.4202	76.1539	79.4900	50
74.3970	79.0819	83.2976	88.3794	91.9517	60
85.5271	90.5312	95.0231	100.425	104.215	70
96.5782	101.879	106.629	112.329	116.321	80
107.565	113.145	118.136	124.116	128.299	90
118.498	124.342	129.561	135.807	140.169	100