THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES DEGREE PROGRAMME
LEVEL 05 2008/2009
FINAL EXAMINATION 2009
QUANTITATIVE TECHNIQUES FOR MANAGEMENT II – MCU 3209

DATE : 01.03.2009 **TIME : 1.30 pm – 4.30 pm**

INSTRUCTIONS
Duration: Three Hours
ANSWER ANY FIVE (05) QUESTIONS.
All questions carry equal marks.

This question paper has seven questions.
Use of a non-programmable calculator is allowed.
Normal and Chi-square tables are annexed herewith.
$e^1 = 2.71$

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(1) (a) Briefly explain any three properties of the Normal curve.

(b) How do you transform a Normal Distribution to a Standard Normal Distribution? Explain the advantages of this transformation.

(c) A nursery sells a certain type of plants. The heights of these plants are normally distributed with a mean of 20 cm and a standard deviation of 4cm. Plants which measure between 18cm and 23cm are sold at Rs. 50/- and the rest at Rs. 30/- each. Calculate;

(i) The percentage of plants of which the height is more than 20cm.

(ii) How many plants are of measurements 12cm or less?

(iii) Find the total amount collected if the nursery has 10,000 plants and all plants could be sold.

(2) (a) For a Binomial Distribution the mean and the variance are 4 and 2 respectively. Find the probabilities of getting (i) exactly 2 successes and (ii) 2 or more successes.

(b) If the probability of a male birth is 50%, what is the probability of a family with 4 children having

(i) at least one boy

(ii) at least one boy and one girl

(c) The probability that a computer will be down for repairs next week is 1/2. A computer centre has 100 such machines. Assume occurrences of these incidents are independent. What is the probability that at least 60 machines will be down next week?

(3) (a) Explain $P(X=x)=\frac{e^{-a}a^{x}}{x!}$. Evaluate the expression $\frac{e^{-a}a^{x}}{x!}$ when a = 3 and $x = 4$ and interpret the answer.

(b) A guest house has two rooms which it hires day by day. It is observed that the demand for a room on a day follows a Poisson distribution with mean 1.5. Calculate the probability and the number of days in this year that

(i) both rooms are vacant on a particular day.

(ii) some demand has to be refused on a particular day.

(c) A shaving razor manufacturer makes packets of 5 and 10. It is found that 5 out of each batch of 500 razors manufactured are defective. (Assume defects follow a Poisson distribution.) Find the probability that randomly selected packet of (i) 5 razors and (ii) 10 razors are free of defects.

(4) (a) Explain the necessity to analyze time series data. Briefly explain each of the four main components of time series data.

(b) The seasonal indices of the sales of a footwear manufacturer are given below.

Quarter	Seasonal index
Jan. - March	96
April - June	85
July - Sept.	84
Oct. – Dec	135

If the total sales in the first quarter of the year is estimated to be Rs. 60,000/- and the sales are expected to rise by 6% in each quarter, determine how much worth of footwear of this type be kept in stock, to meet the demand of the each quarter of the year.

(5) (a) The following table gives all samples from the same size, drawn from a certain population according to a criterion for testing the null hypothesis (H_0).

	H_0 True	H_0 False	**Total**
Reject H_0	5	55	**60**
Accept H_0	30	10	**40**
Total	**35**	**65**	**100**

Find the level of significance, probability of the type II error, power of the test and size of critical region for the above.

(b) A producer of PVC pipes claims that at least 95% of its products supplied to a distributor confirmed to standard specifications. An examination of 200 pipes reveled that 4 were faulty. Test this claim at (i) 5% and (ii) 1% level of significance?

(c) A food processing company has two plants and suspects that the mean drained weight of the contents of a can is higher at plant 1 than plant 2. To test this they draw a random sample of 100 cans from each plant and construct a 90% confidence interval for difference of means.

The study revealed the following.

	Plant 1	Plant 2
Mean (gm)	23.0	23.8
Variance	.64	.36
Sample size	100	100

Make your comments.

(6) (a) Explain how Chi-square test is used to test the association of two attributes.

(b) In a factory 200 employees were employed on a specific task. 150 of them were sent for a training programme and out of which 90 were observed as good performers. Out of those who were not sent for the training program, 30 were rated as poor performers. Present these data on a table. Find whether the training programme is effective or not? (Use 5% level of significance)

(7) Write short notes on any <u>four</u> (04) of the following.

(a) Discrete probability distributions.

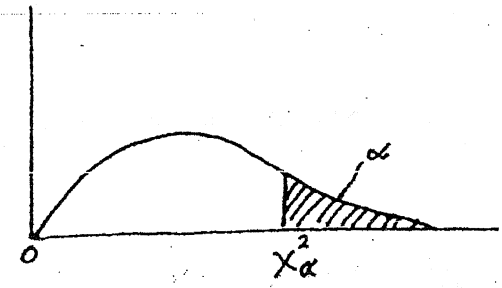
(b) Interpretation of coefficient of correlation.

(c) Permutations and combinations.

(d) Random and non-random sampling methods.

(e) Sample frame and sample size.

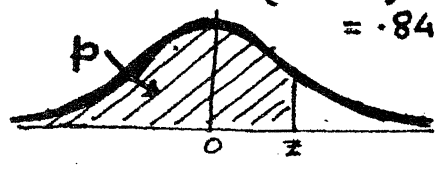
Chi-Square Table: Values of X^2_α



$X^2_{.10}$	$X^2_{.05}$	$X^2_{.025}$	$X^2_{.01}$	$X^2_{.005}$	*df*
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
10.6446	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

P(z = 1.01) = .843752

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	.791030	.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