THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES – LEVEL 5
ASSIGNMENT TEST 2007
QUANTITATIVE TECHNIQUES FOR MANAGEMENT – MCU 3209
DURATION TWO (02) HOURS

DATE: 12TH AUGUST 2007	**TIME: 10.00 a.m. – 12.00 noon**

Answer any four questions.
Standard normal tables are provided. Uses of non-programmable calculators are allowed.
This paper contains six questions.

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1. a) Describe the properties of the Normal distribution.
   b) Powdered milk is packed in tins. The weight of the contents in the tin is normally distributed with mean 425 grams and standard deviation 25 grams.
      (i) What percentage of tins will have less then 450 grams of milk powder?
      (ii) In a consignment of 1000 tins
         a) How many tins will have more than 480 grams of milk?
         b) How many tins will have less than 400 grams of milk?
      (iii) What should the size of the consignment be such that there will be 1000 tins with at least 400 grams of milk powder?

2. a) Evaluate the expression ${}^{n}C_{r}p^{r}q^{(n-r)}$ when
   n = 5, r = 3 and p = 0.8

   b) "Vitamin E" tablets are packed in sealed cards. Each card contains 8 tablets. The probability that a tablet is contaminated is 0.2.
      (i) What is the probability that none of the tablets are contaminated?
      (ii) What is the probability that all the tablets are contaminated?
      (iii) What is the probability that less than two tablets are contaminated?
      (iv) Suppose the probability that a tablet is contaminated is unknown. However, it is known that the probability that none of the tablets are contaminated is equal to the probability that all the tablets are contaminated. What is the probability that a tablet is contaminated?

3. a) Evaluate the expression $\frac{e^{-a}a^{x}}{x!}$ when a = 2, x = 3 and e = 2.71

   b) Explain how you would decide whether a given variable has a Poisson distribution.

c) At a barber shop on the average 2 customers arrive every hour.

(i) What is the probability that exactly one customer will arrive in the next hour?

(ii) What is the probability that less than two customers will arrive in the next hour?

(iii) What is the probability that exactly one customer will arrive within the next two hours?

4. The following table describes the daily output and the number of years of service of eight operators.

OPERATORS NUMBER	NUMBER OF YEARS OF SERVICE	DAILY OUTPUT "000
1	7	1.0
2	12	2.0
3	25	4.0
4	5	0.6
5	10	1.8
6	30	4.2
7	20	3.6
8	15	3.0

(i) Calculate the coefficient of correlation between years of service and daily output.

(ii) Develop the regression equation of the form $y = a + bx$ where "y" is the output and "x" is years of service.

(iii) Estimate the daily output of an operator with 18 years of service.

5. a) Briefly explain the four components of a time series.

b) The percentage of actual sales as against the centered moving average for each quarter for the five years is explained in the table below.

YEAR	QUARTER			
	1	2	3	4
1996	-	-	102.7	103.1
1997	107.2	86.9	100.0	107.3
1998	109.8	88.8	100.4	104.4
1999	112.3	90.0	101.2	106.7
2000	110.4	87.1	102.1	105.4

(i) Calculate the quarterly seasonal indexes.
(ii) If the sales forecast (estimate trend value) for year 2001 third quarter is 38.7, estimate the actual sales for the third quarter of year 2001.

6. Write short notes on the following.
   a) Coefficient of Correlation
   b) Probability
   c) Sampling error
   d) Scatter diagramme
   e) Null hypothesis

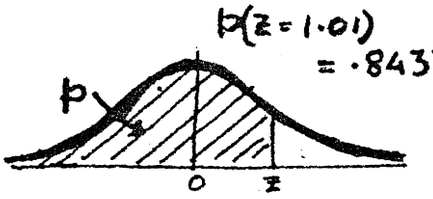
Useful formula

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

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

$$a = \frac{\sum y}{n} - b.\frac{\sum x}{n}$$

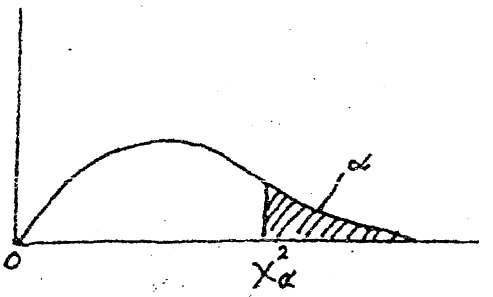
P(z = 1.01) = .843752



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

Chi-Square Table: Values of X_α^2



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