089

THE OPEN UNIVERISTY OF SRI LANKA
COMMONWELATH EXECUTIVE MASTER OF BUSINESS/PUBLIC ADMINISTRATION
FINAL EXAMINATION – 2008
MCP 1607 – QUANTITATIVE TECHNIQUES FOR MANAGERS
DURATION : THREE (03) HOURS

DATE :22.02.2009 **TIME : 9.30am to 12.30pm**

Instructions to Candidates

a) Answer any five (5) Questions
b) Each question carry 20 marks
c) Write your index number on every answer sheet
d) Use of a non programmable calculator is allowed
e) Graph papers will be provided.

Q1. (1) a) Find the differential coefficient of the following funitions with respect to "x"

(i) $2x^2 + 7x + \frac{3}{x}$ (ii) $2(x^3 + 4)(2x + 3)$ (iii) $\frac{x}{\sqrt{(x+1)}}$

b) Find the integral of the following functions with respect to "x"

(i) $5x^4 + 3x^2 + 2x + 4)$ (ii) $\frac{2x}{3x^2 + 4}$

c) Solve the following definite integral

$$\int_{10}^{20} (2x^3 + 3x + 7)dx$$

d) A business organization observes that there is a gradual decline of their daily revenue. Their daily revenue "R" is given by $R = 800 - t^2$ where "t" is the time measured as number of days from 1st February 2009. Evaluate the revenue earned during the time period t=15, t=30.

Q2. a) A and B are two matrices defined as follow.

$$A = \begin{bmatrix} 5 & 7 & 9 \\ 4 & 6 & 3 \\ 2 & 8 & 7 \end{bmatrix} \text{ And } B = \begin{bmatrix} 4 & 3 & 2 \\ 1 & 4 & 1 \\ 1 & 6 & 3 \end{bmatrix}$$

Evaluate the following

(i) A + B
(ii) A - B
(iii) 4 x A (Scalar Multiplication)
(iv) A^{-1} (Inverse of matrices A)

b) The monthly sales volume of 3 products x, y and z in two different markets, Colombo and Kandy are given below.

Market	Product (Qty)		
	X	Y	Z
Colombo	3000	5000	8000
Kandy	2000	6000	5000

The unit price for the products x, y, and z are Rs. 3/-, 5/- and 10/- respectively.

a) Represent the sales and selling prices by matrices.
b) Using the matrices find the sales of each market.

Q3. a) Briefly explain the following three measures of probability indicating at what situations they are appropriate.

(i) Mathematical probability
(ii) Statistical probability
(iii) Subjective probability

b) Briefly explain the terms "Prior Probability" and "Posterior Probability".

c) The manager of a hardware wholesaler has asked the bookkeeper to call all the customers five days before their account payments are due, as a means reducing late payments. As a result of time constrains the bookkeeper could able to contact only 70% of the customers. Out of the customers who received calls from the book keeper 85% paid on time while out of customers who did not receive calls from bookkeeper 25% paid on time. Suppose a customer is selected at random.

(i) What is the probability that he has received a call and paid on time?
(ii) What is the probability that he has received a call given that he has paid on time?
(iii) What is the probability that he has not received a call given that he has paid on time?

Q4. a) Briefly discuss the importance of the chi-squared test in management decision making.

b) The university is concerned about the poor performance of students at the examination. They believe that the poor attendance at day school is the cause. The performance and attendance of a sample of 300 students is described in the table below.

ATTENDENCE AT DAY SCHOOS (PERCENTAGE)	PERFORMANCE AT EXAMINATION (PERCENTAGE MARKS RECIEVED)				
	<30%	31% - 50%	51% - 75%	75% - 100%	Total
<20%	100	35	10	5	150
21% - 50%	35	30	25	10	100
51% - 100%	15	15	15	5	50
Total	150	80	50	20	300

Carried out a Chi-Squared test to investigate whether attendance at day schools and performance were related. Carry out the test at 5% level of significance. Give your opinion.

Q5 It is suggested that the output of machine operators is related to their years of service. To justify this proposition, data on six machine operators has being gathered as describe below. In this table while "x" represent years of service the variable "y" indicates the output measured in "000 units".

x	y	x^2	y^2	xy
2	1	4	1	2
7	8	49	64	56
9	12	81	144	108
5	4	25	16	20
3	2	9	4	6
6	9	36	81	54
32	**36**	**204**	**310**	**246**

(i) Calculate the correlation coefficient between "x" and "y" interpret the results.
(ii) Evaluate the regression line of the form $y = a + bx$
(iii) Predict the value of output when years of service is 12
(iv) What is the residual of the observation where "x" is 7?
(v) Evaluate the sum of squares of residuals given as SSE Interpret the results.
(vi) Calculate the coefficient of determination interpret the result.
(vii) Test the hypothesis that "years of service" has an impact on 'output' (Hypothesis that $b = 0$).
(viii) Find the 95% confidence interval for the estimate of slope.

Q6. A project consists of nine activities A, B,C, ……, I whose precedence, duration and resource requirements are shown in the table below. The only resource used is men.

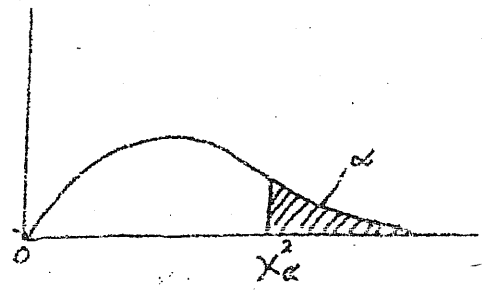
ACTIVITY	PRECEDENCE	DURATION (WEEKS)	RESOURCES (MEN)
A	PROJECT START	8	5
B	PROJECT START	6	7
C	PROJECT START	7	8
D	AFTER "A"	5	4
E	AFTER "B" and "D"	7	4
F	AFTER "A"	4	5
G	AFTER "C"	3	6
H	AFTER "E" and "F"	4	3
I	AFTER "H" and "G"	6	2

(i) Construct the network diagram.
(ii) Time Analyse and name the critical path.
(iii) Find "EST", "ETF", "LFT" and "LST" in respect of activity "G".
(iv) Draw the time scale network and resources histogramme
(v) Explain how you would organize your activities if there are only 12 men available. (No need to draw the time scale network again. You are required to show how you would shift the activities).

Q7. Write short notes on the following

a) Ladder activities
b) Descriptive and inferential statistics
c) Convolutions
d) Residual analysis
e) Time series data and their components.

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

Line of regression $y = a + bx$

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

SSE = sum of all (residual)^2 Terms.

Coefficient of determination = r^2

$$Syx = \sqrt{\frac{SSE}{(n-2)}}$$

$$SB_1 = \frac{Syx}{\sqrt{ssx}} \text{ where } SSX = \sum (x_i - \bar{x})^2 = \sum x_i^2 - n\bar{x}^2$$

$$\text{Standard error} = \frac{S}{\sqrt{n}}$$

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