THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES – LEVEL 06
ASSIGNMENT TEST 2010/2011
OPERATIONS RESEARCH – MCU 4202

DATE: 04.07.2010   **TIME: 10.00AM -12.00 NOON**

ANSWER ANY FOUR QUESTIONS ONLY.

Q1.   Briefly explain how operational Research Techniques could be helpful in Management Decision Making indicating their limitations and what precautions you need to take.

Q2.   A project consists of eight activities whose precedance and durations are explained in the table below.

ACTIVITY	PRECEDANCE	DURATION DAYS
A	PROJECT START	2
B	PROJECT START	9
C	AFTER "A"	7
D	AFTER "A"	5
E	AFTER "C"	8
F	AFTER "C"	6
G	AFTER B,D,E	4
H	AFTER F, G	4

(i)   Construct network diagramme.
(ii)   Find the float of each activity.
(iii) Name the critical path.
(iv)   Find EST, EFT, LFT and LST of Activity "D".

Q3.   A project consists of six activities whose precidance and Optimistic, Most Likely and Pecimistic estimates of duration are explained in the table below.

ACTIVITY	PRECEDENCE	DURATION (DAYS)		
		OPTIMISTIC	MOST LIKELY	PECEMISTIC
A	PROJECT - START	3	5	7
B	PROJECT - START	1	2	3
C	AFTER "A"	4	7	10
D	AFTER "A"	2	3	4
E	AFTER B & C	2	4	6
F	AFTER D & E	3	4	5

$$\text{Mean of Duration} = \frac{0 + 4M + P}{6}$$

O - Optimistic

M – Most Likely

$$\text{SD of Duration} \quad \frac{P - 0}{6}$$

P - Pecimistic

(i)   Construct the network
(ii) Calculate the mean and standard deviation of duration of each activity.
(iii) Time analysis and name the critical path
(iv) What is the probability that the project would take more than 22 days.

Q4. a) State the condition for equilibrium in a single server queue.

b) At a petrol station there is only one unit to pump petrol and vehicles arrive in a poission fashion at the rate of 10 per hour. The mean time taken to pump petrol to one vechicle is 5 minutes and has a negative exponential distribution.

(i)   What is the probability that there are three vehicles at the petrol station?
(ii) What is the average number of vehicles at the petrol station?
(iii) How long on the average must a vehicle wait at the station to pump petrol?

Q5. Briefly explain the term "Simulation" with an example high lighting it's advantages and disadvantages.

riables:
λ = Rate of arrival of units
μ = Rate of service completion
$\theta = \lambda / \mu$

H = Number of working hours per day.
$P_{(n)}$ = Probability of "n" units in the queuing system
L_s = Average number of units in queuing system
L_q = Average number of units in queue
W_s = Average time spent by unit in queuing system
W_q = Average time spent by unit in queue.

rmulae

$$P(n) = \theta P(n-1) \underline{\hspace{2cm}} \quad (1)$$

$$P(n) = \theta^n P(0) \underline{\hspace{2cm}} \quad (2)$$

$$P(n) = \theta^n (1-\theta) \underline{\hspace{2cm}} \quad (3)$$

$$\left(\begin{array}{l}\text{Probability that}\\ \text{queuing system empty}\end{array}\right) = (1-\theta) \underline{\hspace{2cm}} \quad (4)$$

$$\left(\begin{array}{l}\text{Probability that the}\\ \text{server is idle}\end{array}\right) = (1-\theta) \underline{\hspace{2cm}} \quad (5)$$

$$\left(\begin{array}{l}\text{Number of hours}\\ \text{server idle per day}\end{array}\right) = H(1-\theta) \underline{\hspace{2cm}} \quad (6)$$
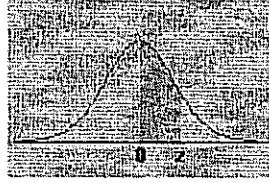
$$L_s = \theta / (1-\theta) \underline{\hspace{2cm}} \quad (7)$$

$$L_q = \theta^2 / (1-\theta) \underline{\hspace{2cm}} \quad (8)$$

$$L_s = \lambda W_s \underline{\hspace{2cm}} \quad (9)$$

$$L_q = \lambda W_q \underline{\hspace{2cm}} \quad (10)$$

riables:

Area between 0 and z

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990