THE OPEN UNIVERSITY OF SRI LANKA

BACHELOR OF MANAGEMENT STUDIES LEVEL (06)

ASSIGNMENT TEST, MARCH 2007

OPERATIONS RESEARCH MCU 4202

DURATION : 2HOURS

DATE : 25.03.2007 **TIME : 10.00am – 12.00noon**

ANSWER ANY FOUR QUESTIONS

(01) Four research teams R1, R2, R3 and R4 are to be assigned to four research projects P1, P2, P3, and P4. The time taken by a given research team to complete a given research project is explained in the table below.

TIME TAKEN TO COMPLETE PROJECT (Months)

	P1	P2	P3	P4
R1	14	8	11	12
R2	8	6	7	9
R3	17	14	12	10
R4	15	17	16	8

Find the optimal assignment plan that would minimize the total time taken to complete All four projects.

(02) 250 cubes of sand has to be transported daily between these suppliers S1, S2, and S3 and these worksites W1, W2 and W3. The daily capacity of S1, S2 and S3 are respectively 50, 75 and 125. The daily demand of W1, W2 and W3 are respectively 80, 70 and 100. This information on demand and supply and the cost of transporting one cube between Suppliers and Worksites is explained in the tables below.

SUPPLY AND DEMAND

	W1	W2	W3	Supply
S1				50
S2				75
S3				125
Demand	80	70	100	250

COST MATRICS

	W1	W2	W3
S1	3	5	1
S2	7	3	4
S3	2	6	8

Find the optimal pattern of transporting material between the Supplier and Worksite that would minimize total Transportation Cost

(03) A project consists of seven activities A, B, C, …., G whose precedence and durations are explained in the table below.

ACTIVITY	PRECEDANCE	DURATION (Days)
A	Project Start	4
B	Project Start	5
C	Project Start	3
D	After "C"	3
E	After "A"	7
F	After "B" and "D"	2
G	After "E" and "F"	3

(i) Construct the network.
(ii) Time analyze and find the float of each activity.
(iii) Name the critical path.
(iv) Find the EST, EFT, LFT and LST of each activity.

(04) At a dental clinic patient arrive in a Poisson fashion at the rate of 4 per hour. The dentist on the average takes 12 minutes per patient. And this service time has a negative exponential distribution. The dentist works 10 hours per day.

(i) On the average, how many hours does the dentist idle per day?
(ii) What is the probability that there are three patients at the clinic?
(iii) On the average, how many patients are there at the clinic?
(iv) On the average, how long must a patient have to wait at the clinic?
(v) Suddenly the rate of arrival of patients has increased to six. The average number of patients at the clinic, when works out as - 6. But this can not be a negative quantity. Explain the error that has taken place.

(05) Write short notes
(i) Simulation
(ii) Critical Path
(ii) Queue – Discipline
(iv) Assignment Theory

Variables

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.

Formulae

$$P(n) = \theta P(n-1) \quad \text{——————} \quad (1)$$

$$P(n) = \theta^n P(0) \quad \text{——————} \quad (2)$$

$$P(n) = \theta^n (1-\theta) \quad \text{——————} \quad (3)$$

(Probability that queuing system empty) $= (1-\theta)$ —————— (4)

(Probability that the server is idle) $= (1-\theta)$ —————— (5)

(Number of hours server idle per day) $= H(1-\theta)$ —————— (6)

$$L_s = \theta / (1-\theta) \quad \text{——————} \quad (7)$$

$$L_q = \theta^2 / (1-\theta) \quad \text{——————} \quad (8)$$

$$L_s = \lambda W_s \quad \text{——————} \quad (9)$$

$$L_q = \lambda W_q \quad \text{——————} \quad (10)$$