THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES DEGREE PROGRAMME
LEVEL 06 - ASSIGNMENT TEST 2015/16
OPERATION RESEARCH - MCU 4202
DURATION: TWO (02) HOURS

DATE: 27.09.2015 **TIME: 10.00 am – 12.00 noon**

ANSWER THREE QUESTIONS ONLY.
ALL QUESTIONS CARRY EQUAL MARKS.

(01) Four projects P_1, P_2, P_3 and P_4 are to be implemented. These projects could be implemented in any of the four locations L_1, L_2, L_3 or L_4. But the labor requirement would depend on the particular project and the location it is assigned, as shown in the table below.

Labor Requirement

	L_1	L_2	L_3	L_4
P_1	12	17	14	15
P_2	7	6	8	9
P_3	21	15	27	20
P_4	15	11	17	18

a) Find the optimal plan of assignment projects to location that would minimize the total labor requirement.

b) Find the optimal plan of assigning project to locations given that project P_2 should not be assigned to location L_3.

(02) A project consists of six activities, A, B, C, ... F whose precedence and durations are explained in the table below.

ACTIVITY	PRECEDENCE	DURATION (DAYS)
A	Project Start	5
B	Project Start	6
C	After "A"	6
D	After "A"	8
E	After "B" and "D"	7
F	After "C" and "E"	5

(i) Construct the network.

(ii) Time analyze and find the float of each activity.

(iii) Name the critical path.

(iv) Calculate EST, EFT, LFT and LST of each activity.

(v) What is the earliest project completion time?

(03) At a laboratory blood samples are received in a poisson fashion at the rate of 8 per hour. There is only one technologist who on the average takes 6 minutes to test one blood sample. The laboratory works 10 hours a day.

(i) How many hours does the technologist idle per day?

(ii) What is the probability that there are three blood samples at the laboratory?

(iii) On the average how many blood samples are there in the laboratory?

(iv) How long will a blood sample have to be kept at the laboratory?

(v) On the average how many blood samples are there waiting to be tested in the laboratory?

(vi) How long must a blood sample be kept until it is taken for testing?

(vii) Blood samples, as they are received are put in a freezer that has a capacity to hold 8 blood samples. If the freezer is full the sample is kept out side. What is a probability that a blood sample just received is kept outside the freezer?

(04) Sanjeewa company has three factories A, B and C that turns out gas cookers. The weekly capacities of the factories A, B and C are 5000, 6000 and 2500 respectively. These cookers are transported to four distribution centers P, Q, R and S whose weekly demands are 6000, 4000, 2000 and 1500. The cost of transporting one unit from a given factory to a given distribution center is explained in the table below.

Cost of Installation (Rs. 000)

FACTORY	DISTRIBUTION CENTRE			
	P	Q	R	S
A	3	2	7	6
B	7	5	2	3
C	2	5	4	5

Sanjeewa company wishes to develop the transportation plan that would minimize total cost of transport.

(i) Find an initial feasible solution using north-west or least cost method.

(ii) Solve the transportation problem using either MODI method or stepping stone method.

(05) Write short notes on the following with suitable illustrations.

a) Critical Path

b) Balanced Transportation Problem

c) Limitations of Assignment Theory

d) North West Corner Rule Method

e) Advantages of graphical method and simplex method in solving Linear Programming problems

Formulae

λ = Rate of arrival of units

μ = Rate of service completion

θ = λ/μ

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 units in queuing system

W_q = Average time spent by units in queue

$P(n) = \theta P(n-1)$ ——— (1)

$P(n) = \theta^n P(0)$ ——— (2)

$P(n) = \theta^n (1-\theta)$ ——— (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) = $H(1 - \theta)$ ——— (5)

$L_s = \theta/(1 - \theta)$ ——— (7)

$L_q = \theta^2/(1 - \theta)$ ——— (8)

$L_s = \lambda W_s$ ——— (9)

$L_q = \lambda W_q$ ——— (10)