

THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES DEGREE PROGRAMME
LEVEL 6 - 2014/2015
ASSIGNMENT TEST: 2014
OPERATIONS RESEARCH – MCU 4202



Duration: TWO (02) Hours

Date: 18th October, 2014

Time: 10.00 am – 12.00 noon

This Question Paper consists of Three (03) pages and has Five (05) questions.

Instructions:

- Answer **any four** questions.
- All questions carry equal marks (25 marks each). Maximum marks : 100
- Use of a non-programmable calculator is allowed.

Q1. a) Describe the method of solving maximization problem using assignment algorithm. (5 marks)

b) 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.

	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

Find the optimal plan of assigning projects to locations that would minimize the total labor requirement. (20 marks)

Q2. A project consists of six activities A, B, C,.... and 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 a network diagramme for the project. (6 marks)
- (ii) Calculate the float of each activity. (6 marks)
- (iii) Name the critical path. What is the shortest completion time of the project? (7 marks)
- (iv) Calculate EST, EFT, LFT and LST of activity "C". (6 marks)

Q3. a) Briefly explain the three types of costs involved in maintaining stocks (Inventories) in an organization. (5 marks)

b) A motor car manufacturer observes that the annual demand for one of its special spare part is 6000 units. The cost of placing one order for this spare part is Rs. 1800/= and the cost of holding one spare part for one year is Rs. 15/=. Assume that stock outs are not allowed; Calculate:

- (i) Economic order quantity (EOQ) (4 marks)
 - (ii) The total cost corresponding to this EOQ. (4 marks)
 - (iii) Re- order level (ROL) if lead time is one month. (4 marks)
 - (iv) Re-order level (ROL) if lead time is three month. (4 marks)
- c) State the assumptions used in computing the above values. (4 marks)

Q4. a) 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 number of blood samples can be tested in one hour? (3 marks)
- (ii) How many number of hours does the technologist idle per day? (3 marks)
- (iii) What is the probability that there are three blood samples at the laboratory? (3 marks)
- (iv) On the average how many blood samples are there in the laboratory? (3 marks)
- (v) How long will a blood sample have to be kept at the laboratory? (3 marks)
- (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? (5 marks)

b) With examples briefly explain queuing theory and queuing discipline. (5 marks)

Q5. Write short notes on the following with suitable illustrations.

- (i) Order Quantity of an inventory system when quantity discounts are available. (8 marks)
- (ii) Re-Order Level and buffer stocks of an inventory system. (6 marks)
- (iii) Cost analysis of a project network diagram (6 marks)
- (iv) The situations where assignment algorithms could be used by managers. (5 marks)

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FORMULA LIST

- (i) Server idle time = $H(1-\theta)$
- (ii) $L_s = \frac{\theta}{1-\theta}$
- (iii) $L_s = \lambda W_s$ and $L_q = \lambda W_q$
- (iv) $P_n = \theta^n (1 - \theta)$
- (v) $L_q = \frac{\theta^2}{1-\theta}$
- (vi) $EOQ = \sqrt{\frac{2DA}{c}}$
- (vii) $k = \frac{DA}{Q} + \frac{1}{2} QC$
- (viii) $EOQ = \sqrt{\frac{2DA}{c}} \left(\frac{c+s}{s} \right)$
- (ix) Maximum level of stock = $\frac{S \times EOQ}{c + s}$