

EASTERN UNIVERSITY SRI LANKA
FACULTY OF COMMERCE AND MANAGEMENT

FOURTH YEAR SECOND SEMESTER EXAMINATION IN BACHELOR OF COMMERCE
2013/2014 (April 2017) - SPECIAL REPEAT
COC 4073 OPERATIONS RESEARCH

All Questions

Time: 03 Hours

- (i) A small project consists of seven activities for which the relevant data is given below.

Activity	Preceding Activities	Days
A	-	4
B	-	7
C	-	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

Required

- a) Draw the network and find the project completion time.

(05 Marks)

- b) Calculate the total float for each activity.

(05 Marks)

- (ii) A civil engineering firm has to bid for the construction of a dam. The activities and their times estimates are given below.

Activity	Optimistic (days)	Most likely (days)	Pessimistic (days)
1-2	14	17	25
2-3	14	18	21
2-4	13	15	18
2-8	16	19	28
3-4 (dummy)	0	0	0
3-5	15	18	27
4-6	13	17	21
5-7 (dummy)	0	0	0
5-9	14	18	20
6-7 (dummy)	0	0	0
6-8 (dummy)	0	0	0
7-9	16	20	41
8-9	14	16	22

The policy of the firm with respect to submitting bids is to bid the minimum amount that will provide 95% of probability of at best breaking-even. The fixed costs for the project are Rs.800,000 and the variable costs are Rs.9,000 every day spent working on the project.

Required:

What amount should the firm bid under this policy?

(10 Marks)

(Total 20 Marks)

02. (i) What are the assumptions underlying the economic order quantity?
- (ii) What costs might a business incur as a result of holding too low a level of inventories?
- (iii) A factory requires 1,500 units of an item per month. The cost of each unit is Rs.27 per order is Rs.150 and material carrying charge works out to 20% of the average. Find out economic order quantity and ascertain the number of orders to be placed. Would you accept a 2% price discount on a minimum supply of 1,200 units.

(Total 15)

03. There are three plants (P1, P2, and P3) of a factory that produces 110, 130, and 190 units of respectively to distribute to 4 markets (M1, M2, M3, and M4) the respective demands 60, and 150 units. The following table provides unit transportation cost (in Rs.) from every plant of the market.

Plant	Market			
	M1	M2	M3	M4
P1	21	16	15	3
P2	17	18	14	23
P3	32	27	18	41

- a) Find the initial allocation and its transportation cost using Least cost method.
- b) Find the optimal allocation and its transportation cost using Stepping stone method.
- c) Formulate this transportation problem as a linear programming model.

(20 Marks)

04. Larbort Limited has been operating with five canteens, which would be assigned to 5 different operators, as a company policy. The following are every operator's request to the Larbort Limited (in thousand Rs.) to bear their costs partially.

Operator Canteen	01	02	03	04	05	06
C1	60	50	40	50	40	50
C2	60	52	42	48	40	48
C3	62	53	41	51	41	49
C4	61	52	40	51	39	50
C5	63	53	42	49	42	51

- a) Allocate the canteens to the operators in order to minimize the cost incurred.
- b) What is the minimum cost?

(20 Marks)

The Munchies Cereal Company makes a cereal from several ingredients. Two of the ingredients, oats and rice, provide vitamins A and B. The company wants to know how many grams of oats and rice it should include in each box of cereal to meet the minimum requirements of 48 milligrams of vitamin A and 12 milligrams of vitamin B while minimizing cost. One gram of oats contributes 8 milligrams of vitamin A and 1 milligram of vitamin B, whereas one gram of rice contributes 6 milligrams of vitamin A and 2 milligrams of vitamin B. One gram of oats costs Rs. 5, and one gram of rice costs Rs. 3.

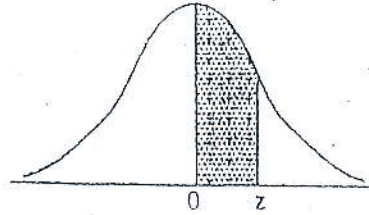
- a) Formulate a linear programming model for this problem.
- b) Solve the model graphically.
- c) Write the standard form of the above model to solve it by the simplex method.
- d) Solve this model using simplex method.

(25 Marks)

TABLE

Area Under Normal Curve

$$z = \frac{x - \bar{x}}{\sigma}$$



z	0	1	2	3	4	5	6	7
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3078
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989