University of Kelaniya – Sri Lanka
Centre for Distance & Continuing Education
Bachelor of Science (General) External
Second year First semester examination (Repeat) - 2019 (2025 May/June)
(New Syllabus)
Faculty of Science

Statistics
STAT 26522 – Optimization II

No. of Questions: **Four (04)** No. of Pages: **Three(03)** Time: **Two (02) Hours.**

Answer **all** the questions.

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1. *(a)* What is the main objective of a transportation model?

   (b) Defining all the necessary variables, formulate the general transportation problem as a linear programming model to minimize the total cost.

   (c) A company has factories at S1, S2, and S3 which supply warehouses at D1, D2, D3 and D4. The weekly capacities of the factories are 18, 3, and 30 respectively. The weekly requirements of the warehouses are 21, 15, 9 and 6 units respectively. Unit shipping costs in Dollars are given in the table below:

	D1	D2	D3	D4
S1	8	21	44	28
S2	4	0	24	4
S3	20	32	60	36

   (i). Find the starting feasible solution to the above problem using the Least Cost method.
   (ii). Considering the solution obtained in *(c) (i),* as the starting feasible solution, find the optimal solution to the above problem using simplex multipliers method.

2.

(a) Compare the **Assignment Problem** with the **Transportation Problem** by listing three **key *characteristics*** of the Assignment Problem

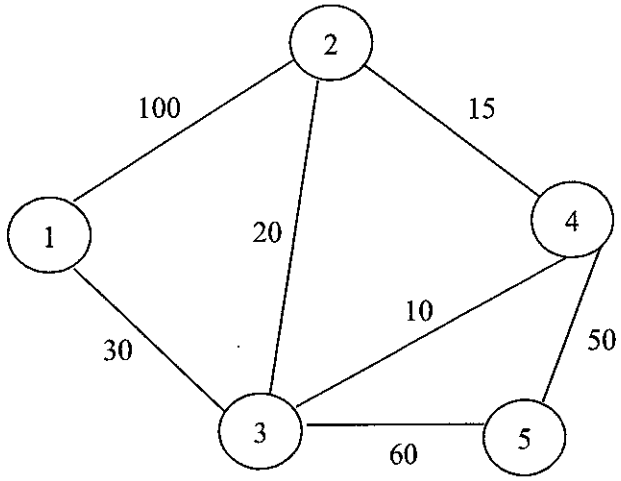
(b) A company produces a single product and sells it through five agencies situated in different cities. Suddenly, there is a demand for the product in five more cities that do not have any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the products to needy cities in such a way that the total traveling distance is minimized. The distances (in km) between the surplus and deficit cities are given in the following matrix:

		New city				
		I	II	III	IV	V
Existing Agencies	A	160	130	175	190	200
	B	135	120	130	160	175
	C	140	110	155	170	185
	D	50	50	80	80	110
	E	55	35	70	80	105

(i) How should the company assign the existing agencies to dispatch the product to the additional cities in such a way that the travelling distance is minimized? The steps of the used algorithm should be clearly mentioned.

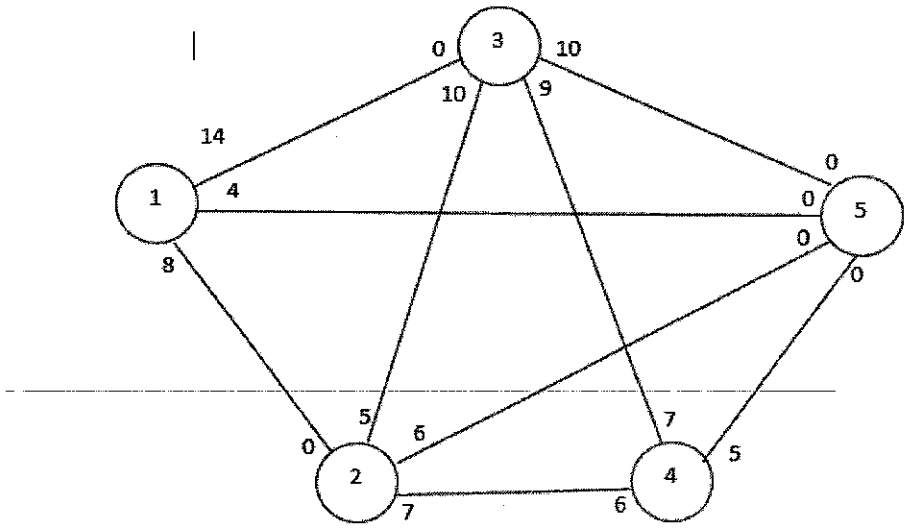
(ii) What will be the total travelling distance corresponding to the optimal assignment?

3. Piyumal rides his bicycle daily from home (Node 1) to school (Node 5). Piyumal hopes to determine the best route with the minimum distance from home to school. The following network shows the possible routes between home and school (Node 1 and Node 5) with distances in certain units. Find the optimal route for Piyumal using the Floyd's algorithm.



4. *(a)* State two applications of the "Maximum flow" problem.

(b) Consider the following network:



Find the maximum flow from node 1 to node 5.

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