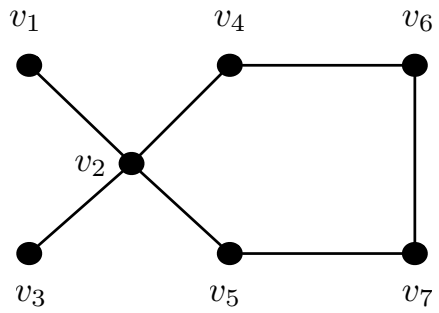
▶ **Problem 9.2-09 (b)**

Consider the graph shown below and answer the following questions.



(i) Makes a table that shows the least number of edges joining each pair of vertices in this graph. (Such a table displays the least number of stops required on air trips between cities in the region depicted by the graph.)

(ii) Add the numbers in each column of the table. Divide each column total by the degree of the corresponding vertex. These ratios are called *accessibility indexes* since they measure the relative accessibility of the cities (by air). Which city is the most accessible? Which is the least accessible?

(iii) Suppose a direct flight joining cities v_1 and v_3 is introduced. What is the the new beta index of the graph? What are the new accessibility indices? Which city is most accessible now? Which city is now least accessible?

(iv) Repeat part (iii), assuming a flight is introduced between cities v_2 and v_6 instead of between v_1 and v_3.

Solution. (i)

	v_1	v_2	v_3	v_4	v_5	v_6	v_7
v_1	0	1	2	2	2	3	3
v_2	1	0	1	1	1	2	2
v_3	2	1	0	2	2	3	3
v_4	2	1	2	0	2	1	2
v_5	2	1	2	2	0	2	1
v_6	3	2	3	1	2	0	1
v_7	3	2	3	2	1	1	0

(ii)

vertex	v_1	v_2	v_3	v_4	v_5	v_6	v_7
column total	13	8	13	10	10	12	12
vertex degree	1	4	1	2	2	2	2
accessibility index	13	2	13	5	5	6	6

Here, v_2 is the most accessible; v_1 and v_3 are the least accessible.

(iii)

New beta index $= \frac{8}{7}$;

New accessibility indices are $6, 2, 6, 5, 5, 6, 6$;

City v_2 is still the most accessible, now v_6 and v_7 are tied with v_1 and v_3 for least accessible.

(iv)

New beta index $= \frac{8}{7}$;

New accessibility indices are $12, 1.4, 12, 5, 5, 3, 6$;

City v_2 is still the most accessible, v_1 and v_3 are the least accessible.

□