

The Open University of Sri Lanka
 Department of Mathematics
 B.Sc/ B.Ed Degree Programme
 No Book Test (NBT) - 2017/2018
 Applied Mathematics– Level 05
 ADU5308 – Graph Theory



DURATION: ONE HOUR

Date: 10 – 02 – 2019

Time: 4.00 p.m. – 5.00 p.m.

ANSWER ALL QUESTIONS. THE TOTAL MAXIMUM MARK ATTAINABLE IS 200
 AND THE FINAL MARK WILL BE CONVERTED TO 100%.

01. Draw the *digraph* $D_1 = (V_1, A_1)$ whose *adjacency list* is given in the following table. [15 Marks]

Vertex	Adjacent Vertices	Vertex	Adjacent Vertices	Vertex	Adjacent Vertices
t	w	v	t, z	x	y, w
u	x, t	w	z, v	y	v, x, z

- (a) Find the *minimum length* of each of the *vertices*

(i) from the *vertex* u , [15 Marks]

(ii) to the *vertex* z , among all the walks in the *digraph* D_1 . [15 Marks]

Hence, determine whether D_1 is *strong* or not. [10 Marks]

- (b) Let $D_2 = (V_1, A_2)$, where $A_2 = A_1 \cup \{(z, u)\}$. Show that D_2 is *strong*. [15 Marks]

Is D_2 a *tournament*? Justify your answer. [10 Marks]

02. Let $L(K_{1,3} + x)$ be the *line graph* of the graph $K_{1,3} + x$, where x is a *line incident* with two of the *points* having *degree* one in $K_{1,3}$.

- (a) Without drawing the graph $L(K_{1,3} + x)$,

(i) determine the number of *lines* in $L(K_{1,3} + x)$,

(ii) find the *degree* of each of the *points* in $L(K_{1,3} + x)$. [50 Marks]

- (b) Draw $L(K_{1,3} + x)$ and $L^2(K_{1,3} + x)$. Hence, verify the results obtained in part (a). [40 Marks]

- (c) Show that $L(K_{1,3} + x)$ and $K_4 - y$ are isomorphic, where y is any *line* deleted from K_4 . [20 Marks]

Hence, deduce that $K_4 - y$ is a *line graph*. [10 Marks]

