

Question 3 [12 marks]:

Alex, Bob, Carol and Daniel must cross a bridge at night before next morning; they all begin on the same side. It is very likely that the bridge will be exploded any time after 56 minutes. They have one flashlight. A maximum of two people can cross the bridge at one time. Any party that crosses, either one or two people, must have the flashlight with them. The flashlight must be walked back and forth by a person until all of them cross to the other end. Alex takes 4 minutes to cross the bridge, Bob takes 7 minutes, Carol takes 29 minutes, and Daniel takes 31 minutes. A pair must walk together at the slower person's pace. Find two alternative ways to get all of them to cross the bridge. In your answer, you must show how they cross the bridge using the most suitable notations introduced in Unit 2's lecture note, and you must also show the time taken for each crossing.

a = Alex, b = Bob, c = Carol, d = Daniel

	First method	mins
1	{abcd //} {cd/ ab -> /} {cd // ab}	7
2	{cd // ab} {cd/ a <- /b} {acd // b}	4
3	{acd // b} {a/ cd -> /b} {a // bcd}	31
4	{a // bcd} {a/ b<- /cd} {ab // cd}	7
5	{ab // cd} {/ ab-> /cd} {// abcd}	7
	total mins	56

	Second Method	mins
1	{abcd //} {cd/ ab -> /} {cd // ab}	7
2	{cd // ab} {cd/ b<- /a} {bcd // a}	7
3	{bcd // a} {b/ cd -> /a} {b // acd}	31
4	{b // acd} {b/ a<- /cd} {ab // cd}	4
5	{ab // cd} {/ ab-> /cd} {// abcd}	7
	total mins	56