Q1. (a) Maximum amount of material that can be sent from node A to node H through the given network = 3+5+2+1+1+1=14

		Iteration 1							
		Starting Flow	/ Matrix						
		N1	N2	N3	N4	N5	N6	N7	N:
		Α	В	С	D	E	F	G	1
N1	Α		8.00	0.00	2.00	0.00	10.00	0.00	0.0
N2	В	8.00		5.00	2.00	3.00	0.00	0.00	0.0
N3	C	0.00	5.00		0.00	2.00	0.00	0.00	10.0
N4	D	2.00	2.00	0.00		1.00	5.00	3.00	0.0
N5	E	0.00	3.00	2.00	1.00		0.00	4.00	1.0
N6	F	10.00	0.00	0.00	5.00	0.00		2.00	0.0
N7	G	0.00	0.00	0.00	3.00	4.00	2.00		6.0
N8	H	0.00	0.00	10.00	0.00	1.00	0.00	6.00	
		Itaration 2	Deceleth	rough flour	- 2.00				
	Labels:	Iteration 2: (1)[0,]-(6)[10		rough flow					
	Labers.	N1		N3		N5	N6	N7	N
			N2 B	C	N4 D	E E	NO.	N/	N
N1	A	Α	8.00	0.00	2.00	0.00	7.00	0.00	0.0
N2		8.00	0.00	5.00	2.00	3.00	0.00	0.00	0.0
NZ N3	В	0.00	5.00	5.00	0.00	2.00	0.00	0.00	
	C			0.00	0.00				10.0
N4	D	2.00	2.00	0.00	4.00	1.00	8.00	0.00	0.0
N5	E	0.00	3.00	2.00	1.00	0.00	0.00	4.00	1.0
N6	F	13.00	0.00	0.00	2.00	0.00	2.00	2.00	0.0
N7	G	0.00	0.00	0.00	6.00	4.00	2.00	0.00	3.0
N8	Н	0.00	0.00	10.00	0.00	1.00	0.00	9.00	
		Iteration 3:	Breakth	rough flow	= 5.00				
	Labels:	(1)[0,]-(2)[8.0							
		N1	N2	N3	N4	N5	N6	N7	N
		A	В	C	D	E	F	G	
N1	Α	· ·	3.00	0.00	2.00	0.00	7.00	0.00	0.0
N2	В	13.00	5.00	0.00	2.00	3.00	0.00	0.00	0.0
N3	С	0.00	10.00	0.00	0.00	2.00	0.00	0.00	5.0
N4	D	2.00	2.00	0.00	0.00	1.00	8.00	0.00	0.0
N5	E	0.00	3.00	2.00	1.00	1.00	0.00	4.00	1.0
N6	F	13.00	0.00	0.00	2.00	0.00	0.00	2.00	0.0
		0.00	0.00	0.00	6.00	4.00	2.00	2.00	
N7 N8	G	0.00	0.00	15.00	0.00	1.00	0.00	9.00	3.0
NO	Н	0.00	0.00	15.00	0.00	1.00	0.00	9.00	
		Iteration 4:	Breakth	rough flow	= 2.00				
	Labels:	(1)[0,-]-(6)[7.0	00.11-(4)(2.00.	61-(2)(2,00,4)	-(5)[3.00.2]-(7)[4.00.5]-(8)[3	.00.71		
		N1	N2	N3	N4	N5		N7	N
		A	В	С	D	E	F	G	
N1	Α		3.00	0.00	2.00	0.00	5.00	0.00	0.0
N2	В	13.00	5.00	0.00	4.00	1.00	0.00	0.00	0.0
N3	С	0.00	10.00	0.00	0.00	2.00	0.00	0.00	5.0
N4	D	2.00	0.00	0.00	0.00	1.00		0.00	0.0
					1.00	1.00			
N5	E	0.00	5.00	2.00		0.00	0.00	2.00	1.0
N6	F	15.00	0.00	0.00	0.00	0.00		2.00	0.0
		0.00	0.00	0.00					
N7 N8	G H	0.00	0.00	0.00 15.00	6.00 0.00	6.00 1.00	2.00 0.00	11.00	1.0

		Iteration 5:	Breakthr	ough flow =	1.00				
	Labels:	(1)[0,]-(6)[5.00	0,1]-{7)[2.00,(6]-(4)[6.00,7]-	(5)[1.00,4]-(3)	[2.00,5]-(8)[5	.00,3]		
		N1	N2	N3	N4	N5	N6	N7	N8
		Α	В	C	D	E	F	G	Н
N1	Α		3.00	0.00	2.00	0.00	4.00	0.00	0.00
N2	В	13.00		0.00	4.00	1.00	0.00	0.00	0.00
N3	С	0.00	10.00		0.00	3.00	0.00	0.00	4.00
N4	D	2.00	0.00	0.00		0.00	10.00	1.00	0.00
N5	E	0.00	5.00	1.00	2.00		0.00	2.00	1.00
N6	F	16.00	0.00	0.00	0.00	0.00		1.00	0.00
N7	G	0.00	0.00	0.00	5.00	6.00	3.00		1.00
N8	H	0.00	0.00	16.00	0.00	1.00	0.00	11.00	
		Iteration 6:	Drogkthr	ough flow =	- 4.00				
	Labels:	(1)[0,]-(6)[4.0				r4 00 31			
	Lubeis.	N1	N2	N3	N4	N5	N6	N7	N8
		A	В	C	D	E	F	G	H
N1	Α	A	3.00	0.00	2.00	0.00	3.00	0.00	0.00
N2	В	13.00	3.00	0.00	4.00	1.00	0.00	0.00	0.00
N3	С	0.00	10.00	0.00	0.00	4.00	0.00	0.00	3.00
N4	D	2.00	0.00	0.00	0.00	0.00	10.00	1.00	0.00
N5	E	0.00	5.00	0.00	2.00	0.00	0.00	3.00	1.00
N6	F	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N7	G	0.00	0.00	0.00	5.00	5.00	4.00	0.00	1.00
N8	Н	0.00	0.00	17.00	0.00	1.00	0.00	11.00	1.00
	Labels:	Iteration 7:		ough flow =	1.00				
			1 41 /4\r4 nn 1	21 /73/14 00 41 /	EVE 00 71 /01	f4 00 51			
				2]-(7)[1.00,4]- N3			N6	N7	N Q
		N1	N2	2]-(7)[1.00,4]- N3	N4	(1.00,5) N5	N6	N7	N8
N1			N2 B	N3 C	N4 D	N5 E	F	G	Н
N1 N2	A	N1 A	N2	N3 C 0.00	N4 D 2.00	N5 E 0.00	3.00	G 0.00	0.00
N2	A B	N1 A 14.00	N2 B 2.00	N3 C	N4 D 2.00 3.00	N5 E 0.00 1.00	3.00 0.00	0.00 0.00	0.00 0.00
N2 N3	A B C	N1 A 14.00 0.00	N2 B 2.00	N3 C 0.00 0.00	N4 D 2.00	N5 E 0.00 1.00 4.00	3.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 3.00
N2 N3 N4	A B C	14.00 0.00 2.00	N2 B 2.00 10.00 1.00	N3 C 0.00 0.00	2.00 3.00 0.00	N5 E 0.00 1.00	3.00 0.00 0.00 10.00	0.00 0.00 0.00 0.00	0.00 0.00 3.00 0.00
N2 N3 N4 N5	A B C	N1 A 14.00 0.00 2.00 0.00	N2 B 2.00 10.00 1.00 5.00	0.00 0.00 0.00 0.00	N4 D 2.00 3.00 0.00	N5 E 0.00 1.00 4.00 0.00	3.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 4.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E	N1 A 14.00 0.00 2.00 0.00 17.00	N2 B 2.00 10.00 1.00 5.00 0.00	0.00 0.00 0.00 0.00 0.00	2.00 3.00 0.00 2.00	N5 E 0.00 1.00 4.00 0.00	3.00 0.00 0.00 10.00 0.00	0.00 0.00 0.00 0.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E F	N1 A 14.00 0.00 2.00 0.00 17.00 0.00	N2 B 2.00 10.00 1.00 5.00 0.00	0.00 0.00 0.00 0.00 0.00 0.00	2.00 3.00 0.00 2.00 0.00 6.00	0.00 1.00 4.00 0.00 0.00	3.00 0.00 0.00 10.00 0.00	0.00 0.00 0.00 0.00 0.00 4.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E	N1 A 14.00 0.00 2.00 0.00 17.00	N2 B 2.00 10.00 1.00 5.00 0.00	0.00 0.00 0.00 0.00 0.00	2.00 3.00 0.00 2.00	N5 E 0.00 1.00 4.00 0.00	3.00 0.00 0.00 10.00 0.00	0.00 0.00 0.00 0.00 0.00 4.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E F	N1 A 14.00 0.00 2.00 0.00 17.00 0.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00	2.00 3.00 0.00 2.00 0.00 6.00	0.00 1.00 4.00 0.00 0.00	3.00 0.00 0.00 10.00 0.00	0.00 0.00 0.00 0.00 0.00 4.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E F	N1 A 14.00 0.00 2.00 0.00 17.00 0.00	10.00 1.00 5.00 0.00 0.00 Breakthr	0.00 0.00 0.00 0.00 0.00 0.00 17.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00	0.00 1.00 4.00 0.00 0.00	3.00 0.00 0.00 10.00 0.00	0.00 0.00 0.00 0.00 0.00 4.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E F G	14.00 0.00 2.00 0.00 17.00 0.00 0.00	10.00 1.00 5.00 0.00 0.00 Breakthr	0.00 0.00 0.00 0.00 0.00 0.00 17.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00	0.00 1.00 4.00 0.00 0.00	3.00 0.00 0.00 10.00 0.00	0.00 0.00 0.00 0.00 0.00 4.00	0.00 0.00 3.00 0.00 0.00
N2 N3 N4 N5 N6	A B C D E F G	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 Iteration 8: (1)[0,-]-{2}[2][2.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 Breakthr 0,1]-(5)[1.00,	0.00 0.00 0.00 0.00 0.00 0.00 17.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00	0.00 1.00 4.00 0.00 0.00 4.00 2.00	3.00 0.00 0.00 10.00 0.00 4.00	G 0.00 0.00 0.00 0.00 4.00 0.00	0.00 0.00 3.00 0.00 0.00 0.00
N2 N3 N4 N5 N6 N7 N8	A B C D E F G	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 lteration 8: (1)[0,-]-(2)[2.00 N1 A	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 0.00 Breakthr 0,1]-(5)[1.00,	N3 C 0.00 0.00 0.00 0.00 0.00 17.00 ough flow = 2]-(7)[4.00,5]- N3 C	2.00 3.00 0.00 2.00 0.00 6.00 0.00 = 1.00 (8)[1.00,7] N4 D	0.00 1.00 4.00 0.00 4.00 2.00	3.00 0.00 0.00 10.00 0.00 4.00 0.00	G 0.00 0.00 0.00 0.00 4.00 0.00	0.00 0.00 3.00 0.00 0.00 1.00
N2 N3 N4 N5 N6 N7 N8	A B C D E F G H	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 lteration 8: (1)[0,-]-(2)[2.00 N1 A	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 0.00 Breakthr 0,1]-(5)[1.00,	0.00 0.00 0.00 0.00 0.00 17.00 0ugh flow = 2]-(7)[4.00,5]- N3 C	2.00 3.00 0.00 2.00 0.00 6.00 0.00 = 1.00 (8)[1.00,7] N4	0.00 1.00 4.00 0.00 4.00 2.00 N5 E 0.00	3.00 0.00 0.00 10.00 0.00 4.00 0.00	0.00 0.00 0.00 0.00 4.00 0.00 11.00	0.00 0.00 0.00 0.00 0.00 0.00 1.00 N88 H 0.00 0.00
N2 N3 N4 N5 N6 N7 N8 N1 N1 N2 N3	A B C D E F G H Labels:	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 Iteration 8: (1)[0,-]-(2)[2.00 N1 A 15.00 0.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 Breakthr 0,1]-(5)[1.00, N2 B 1.00	N3 C 0.00 0.00 0.00 0.00 0.00 17.00 ough flow = 2]-(7)[4.00,5]- N3 C	2.00 3.00 0.00 2.00 0.00 6.00 0.00 = 1.00 (8)[1.00,7] N4 D	N5 E 0.00 1.00 4.00 0.00 4.00 2.00 N5 E 0.00 0.00 4.00	3.00 0.00 0.00 10.00 0.00 4.00 0.00	0.00 0.00 0.00 0.00 4.00 0.00 11.00	0.00 0.00 0.00 0.00 0.00 0.00 1.00 N88 H 0.00 0.00
N2 N3 N4 N5 N6 N7 N8	A B C D E F G H Labels:	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 Iteration 8: (1)[0,-]-(2)[2.00 N1 A 15.00 0.00 2.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 Breakthr 0,1]-(5)[1.00, N2 B 1.00 10.00	N3 C 0.00 0.00 0.00 0.00 0.00 17.00 0ugh flow= 2]-(7)[4.00,5]- N3 C 0.00 0.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00 1.00 8](1.00,7] N4 D 2.00 3.00	0.00 1.00 4.00 0.00 4.00 2.00 N5 E 0.00	N6 F 3.00 0.00 10.00 0.00 4.00 0.00 N6 F 3.00 0.00 0.00	0.00 0.00 0.00 0.00 4.00 0.00 11.00	N8 H 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0
N2 N3 N4 N5 N6 N7 N8 N1 N1 N2 N3	A B C D E F G H Labels:	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 Iteration 8: (1)[0,-]-(2)[2.00 N1 A 15.00 0.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 Breakthr 0,1]-(5)[1.00, N2 B 1.00	0.00 0.00 0.00 0.00 0.00 0.00 17.00 0ugh flow= 2]-(7)[4.00,5]- N3 C 0.00 0.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00 1.00 8](1.00,7] N4 D 2.00 3.00	N5 E 0.00 1.00 4.00 0.00 4.00 2.00 N5 E 0.00 0.00 4.00	3.00 0.00 0.00 10.00 0.00 4.00 0.00	0.00 0.00 0.00 0.00 4.00 0.00 11.00	0.00 0.00 3.00 0.00 0.00 0.00
N2 N3 N4 N5 N6 N7 N8 N1 N1 N2 N3 N4	A B C D E F G H Labels:	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 0.00 Iteration 8: (1)[0,-]-(2)[2.00 N1 A 15.00 0.00 2.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 Breakthr 0,1]-(5)[1.00, N2 B 1.00 10.00	N3 C 0.00 0.00 0.00 0.00 0.00 17.00 0ugh flow= 2]-(7)[4.00,5]- N3 C 0.00 0.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00 1.00 8][1.00,7] N4 D 2.00 3.00 0.00	N5 E 0.00 1.00 4.00 0.00 4.00 2.00 N5 E 0.00 0.00 4.00	N6 F 3.00 0.00 10.00 0.00 4.00 0.00 N6 F 3.00 0.00 0.00	0.00 0.00 0.00 0.00 4.00 0.00 11.00 N7 G 0.00 0.00 0.00	N8 H 0.00 0.00 0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00
N2 N3 N4 N5 N6 N7 N8 N1 N1 N2 N3 N4 N5	A B C D E F G H Labels:	N1 A 14.00 0.00 2.00 0.00 17.00 0.00 17.00 0.00 Iteration 8: (1)[0,-]-(2)[2.00 N1 A 15.00 0.00 2.00 0.00	N2 B 2.00 10.00 1.00 5.00 0.00 0.00 Breakthr 0,1]-(5)(1.00, N2 B 1.00 10.00 6.00	N3 C 0.00 0.00 0.00 0.00 0.00 17.00 0ugh flow = 2]-(7)[4.00,5]- N3 C 0.00 0.00	2.00 3.00 0.00 2.00 0.00 6.00 0.00 1.00 8](1.00,7] N4 D 2.00 3.00 0.00 2.00	N5 E 0.00 1.00 4.00 0.00 4.00 2.00 N5 E 0.00 0.00 4.00	N6 F 3.00 0.00 10.00 0.00 4.00 0.00 N6 F 3.00 0.00 0.00	0.00 0.00 0.00 0.00 4.00 0.00 11.00 N7 G 0.00 0.00 0.00	N8 H 0.00 0.00 3.00 0.00 0.00 0.00 1.00 0.00 0

Q1. (b) Company at node A should purchase the materials from supplier at node H from economic perspective.

Maximum amount of material can be sent from node H to node A = 5+3+2+1+2+1 = 14

		Iteration 1							
		Starting Flow	Matrix						
		N1	N2	N3	N4	N5	N6	N7	N:
		H	В	С	D	Е	F	G	- 1
N1	H		0.00	10.00	0.00	1.00	0.00	6.00	0.0
N2	В	0.00		5.00	2.00	3.00	0.00	0.00	8.0
N3	С	10.00	5.00		0.00	2.00	0.00	0.00	0.0
N4	D	0.00	2.00	0.00		1.00	5.00	3.00	2.0
N5	E	1.00	3.00	2.00	1.00		0.00	4.00	0.0
N6	F	0.00	0.00	0.00	5.00	0.00		2.00	10.0
N7	G	6.00	0.00	0.00	3.00	4.00	2.00		0.0
N8	Α	0.00	8.00	0.00	2.00	0.00	10.00	0.00	
		Iteration 2:		ough flow =					
	Labels:	(1)[0,]-(3)[10.0							
		N1	N2	N3	N4	N5	N6	N7	N8
		H	В	С	D	E	F	G	- 1
N1	H		0.00	5.00	0.00	1.00	0.00	6.00	0.00
N2	В	0.00		10.00	2.00	3.00	0.00	0.00	3.00
N3	С	15.00	0.00		0.00	2.00	0.00	0.00	0.00
N4	D	0.00	2.00	0.00		1.00	5.00	3.00	2.00
N5	E	1.00	3.00	2.00	1.00		0.00	4.00	0.00
N6	F	0.00	0.00	0.00	5.00	0.00		2.00	10.00
N7	G	6.00	0.00	0.00	3.00	4.00	2.00		0.00
N8	Α	0.00	13.00	0.00	2.00	0.00	10.00	0.00	
		Iteration 3:	Decalethe	ough flow =	2.00				
	Labels:			_					
	Labers:	(1)[0,]-(7)[6.00 N1	N2	14(2)[3.00,5]4(N3	8)[3.00,2] N4	N5	N6	N7	N8
							NO		Na
114		Н	В	C	D	E	0.00	G	A 0.00
N1	H	0.00	0.00	5.00	0.00	1.00	0.00	3.00	0.00
N2	В	0.00	0.00	10.00	2.00	6.00	0.00	0.00	0.00
N3	С	15.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
N4	D	0.00	2.00	0.00	4.00	1.00	5.00	3.00	2.00
N5	E	1.00	0.00	2.00	1.00		0.00	7.00	0.00
N6	F	0.00	0.00	0.00	5.00	0.00		2.00	10.00
N7	G	9.00	0.00	0.00	3.00	1.00	2.00		0.00
N8	Α	0.00	16.00	0.00	2.00	0.00	10.00	0.00	

	Laboles	Iteration 4:		ough flow = 2		00.41.60540	00.01		
	Labels:	(1)[0,]-(3)[5.00						N/Z	
		N1	N2	N3	N4	N5	N6	N7	N8
		Н	В	C	D	E	0.00	G	
N1	Н	2.22	0.00	3.00	0.00	1.00	0.00	3.00	0.00
N2	В	0.00	0.00	10.00	2.00	6.00	0.00	0.00	0.0
N3	С	17.00	0.00		0.00	0.00	0.00	0.00	0.0
N4	D	0.00	2.00	0.00		1.00	3.00	5.00	2.0
N5	E	1.00	0.00	4.00	1.00		0.00	5.00	0.0
N6	F	0.00	0.00	0.00	7.00	0.00		2.00	8.0
N7	G	9.00	0.00	0.00	1.00	3.00	2.00		0.0
N8	Α	0.00	16.00	0.00	2.00	0.00	12.00	0.00	
		Iteration 5:	Breakthro	ough flow = 1	.00				
	Labels:	(1)[0,]-(7)[3.00				00 61			
	Luboioi	N1	N2	N3	N4	N5	N6	N7	N8
		Н	В	C	D	E	F	G	Δ
N1	н		0.00	3.00	0.00	1.00	0.00	2.00	0.00
N2	В	0.00	0.00	10.00	2.00	6.00	0.00	0.00	0.00
N3	С	17.00	0.00	70.00	0.00	0.00	0.00	0.00	0.00
N4	D	0.00	2.00	0.00	0.00	2.00	2.00	5.00	2.00
N5	E	1.00	0.00	4.00	0.00	2.00	0.00	6.00	0.00
N6	E	0.00	0.00	0.00	8.00	0.00	0.00	2.00	7.00
N7	G	10.00	0.00	0.00	1.00	2.00	2.00	2.00	0.00
N8	A	0.00	16.00	0.00	2.00	0.00	13.00	0.00	0.00
140	^	0.00	10.00	0.00	2.00	0.00	15.00	0.00	
		Manager Co.							
		Iteration 6:	Breakthro	ough flow = 2	2.00				
	Labels:	(1)[0,]-(7)[2.00		0					
	Labels:			0		N5	N6	N7	N8
	Labels:	(1)[0,]-(7)[2.00	,1]-(6)[2.00,7]-(4)[8.00,6]-(8)	[2.00,4]	N5 E	N6 F	N7 G	N8
N1	Labels:	(1)[0,]-(7)[2.00 N1	,1]-(6)[2.00,7 N2]-(4)[8.00,6]-(8) N3	[2.00,4] N4		N6 F 0.00		N8 A 0.00
		(1)[0,]-(7)[2.00 N1),1]-(6)[2.00,7 N2 B]-(4)[8.00,6]-(8) N3 C	[2.00,4] N4 D	Е	F	G	Α
N2	н	(1)[0,]-(7)[2.00 N1 H),1]-(6)[2.00,7 N2 B	(4)[8.00,6]-(8) N3 C 3.00	(2.00,4) N4 D 0.00	1.00	F 0.00	G 0.00	0.00 0.00
N2 N3	H B	(1)[0,-]-(7)[2.00 N1 H	,1]-(6)[2.00,7 N2 B 0.00	(4)[8.00,6]-(8) N3 C 3.00	(2.00,4) N4 D 0.00 2.00	1.00 6.00	0.00 0.00	0.00 0.00	0.00
N2 N3 N4	H B C	(1)[0,-]-(7)[2.00 N1 H 0.00	0,1]-(6)[2.00,7 N2 B 0.00	1,4)[8.00,6]-(8) N3 C 3.00 10.00	(2.00,4) N4 D 0.00 2.00	1.00 6.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00 0.00
N1 N2 N3 N4 N5	H B C	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00	0,1]-(6)[2.00,7 N2 B 0.00 0.00	1,4)[8.00,6]-(8) N3 C 3.00 10.00	[2.00,4] N4 D 0.00 2.00 0.00	1.00 6.00 0.00	0.00 0.00 0.00 4.00	0.00 0.00 0.00 5.00	0.00 0.00 0.00
N2 N3 N4 N5	H B C D	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00	,1]-(6)[2.00,7 N2 B 0.00 	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00	[2.00,4] N4 D 0.00 2.00 0.00	1.00 6.00 0.00 2.00	0.00 0.00 0.00 4.00	0.00 0.00 0.00 5.00	0.00 0.00 0.00 0.00 0.00 7.00
N2 N3 N4 N5 N6	H B C D	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00	,1]-(6)[2.00,7 N2 B 0.00 	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00	[2.00,4] N4 D 0.00 2.00 0.00 0.00 6.00	1.00 6.00 0.00 2.00	0.00 0.00 0.00 4.00 0.00	0.00 0.00 0.00 5.00	0.00 0.00 0.00 0.00 0.00 7.00
N2 N3 N4 N5 N6	H B C D E F	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00	,1]-(6)[2.00,7 N2 B 0.00 	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00 0.00 0.00	[2.00,4] N4 D 0.00 2.00 0.00 0.00 6.00 1.00 4.00	1.00 6.00 0.00 2.00	F 0.00 0.00 0.00 4.00 0.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00 0.00 7.00
N2 N3 N4 N5 N6 N7	H B C D E F G	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 0.00 16.00	0.00 0.00 0.00 0.00 0.00 0.00	[2.00,4] N4 D 0.00 2.00 0.00 0.00 6.00 1.00 4.00	1.00 6.00 0.00 2.00 0.00 2.00 0.00	F 0.00 0.00 0.00 4.00 0.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00 0.00 7.00
N2 N3 N4 N5 N6 N7	H B C D E F	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00 0.00 0.00 0.00	(2.00,4) N4 D 0.00 2.00 0.00 6.00 1.00 4.00	1.00 6.00 0.00 2.00 0.00 2.00 0.00	0.00 0.00 0.00 4.00 0.00 0.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00 0.00 7.00
N2 N3 N4 N5 N6 N7	H B C D E F G	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00 0.00 0.00 0.00	(2.00,4) N4 D 0.00 2.00 0.00 6.00 1.00 4.00	1.00 6.00 0.00 2.00 0.00 2.00 0.00	F 0.00 0.00 0.00 4.00 0.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00
N2 N3 N4 N5 N6 N7	H B C D E F G A	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5 N2 B	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00 0.00 0.00 0.00	(2.00,4) N4 D 0.00 2.00 0.00 6.00 1.00 4.00 (4.00,4)-(8)(7.00	1.00 6.00 0.00 2.00 0.00 2.00 0.00	0.00 0.00 0.00 4.00 0.00 0.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00 0.00 7.00
N2 N3 N4 N5 N6 N7 N8	H B C D E F G	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00 0.00 0.00 0.00	(2.00,4) N4 D 0.00 2.00 0.00 6.00 1.00 4.00 [4.00,4]-{8}[7. N4 D 0.00	1.00 6.00 0.00 2.00 0.00 2.00 0.00	0.00 0.00 0.00 4.00 0.00 13.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00 0.00 7.00 0.00
N2 N3 N4 N5 N6 N7 N8	H B C D E F G A Labels:	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1 H	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5 N2 B	1,4)[8.00,6]-(8) N3 C 3.00 10.00 0.00 4.00 0.00 0.00 0.00 0.00	(2.00,4) N4 D 0.00 2.00 0.00 6.00 1.00 4.00 (4.00,4)-(8)(7.00	1.00 6.00 0.00 2.00 0.00 2.00 0.00	0.00 0.00 0.00 4.00 0.00 13.00	G 0.00 0.00 0.00 5.00 6.00 4.00	0.00 0.00 0.00 0.00 0.00 7.00 0.00
N2 N3 N4 N5	H B C D E F G A Labels:	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 (12.00 0.00 (10,-]-(5)[1.00 N1 H	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5 N2 B	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	(2.00,4) N4 D 0.00 2.00 0.00 6.00 1.00 4.00 [4.00,4]-{8}[7. N4 D 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00 0.00 0.00 4.00 0.00 13.00	G 0.00 0.00 0.00 5.00 6.00 4.00 0.00	0.00 0.00 0.00 0.00 0.00 7.00 0.00
N2 N3 N4 N5 N6 N7 N8	H B C D E F G A Labels:	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1 H	0.000 0.000 0.000 0.000 0.000 0.000 0.000 16.000 Breakthre 0,1]+(7)(6.00,5 N2 B	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	[2.00,4] N4 D 0.00 2.00 0.00 6.00 1.00 4.00 [4.00,4]-(8)[7. N4 D 0.00 2.00	00,6] N5 E 0.00 6.00 0.00 0.00 0.00 0.00 0.00 0.	0.00 0.00 0.00 4.00 0.00 13.00	0.00 0.00 0.00 5.00 6.00 4.00 0.00	0.00 0.00 0.00 0.00 7.00 0.00
N2 N3 N4 N5 N6 N7 N8	H B C D E F G A Labels:	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 1.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1 H 0.00 17.00	0.00 0.00 0.00 0.00 0.11-(7)(6.00,5 N2 B 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	0.00	[2.00,4] N4 D 0.00 2.00 0.00 6.00 1.00 4.00 [4.00,4]-(8)[7. N4 D 0.00 2.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00 0.00 0.00 4.00 0.00 13.00	0.00 0.00 0.00 5.00 6.00 4.00 0.00	0.00 0.00 0.00 0.00 7.00 0.00 N8 A 0.00 0.00
N2 N3 N4 N5 N6 N7 N8 N1 N2 N3 N4	H B C D E F G A Labels:	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1 H 0.00 17.00 0.00	,1]-(6)[2.00,7 N2 B 0.00 0.00 2.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5 N2 B 0.00 0.00	0.00 0.	[2.00,4] N4 D 0.00 2.00 0.00 6.00 1.00 4.00 [4.00,4]-{8}[7. N4 D 0.00 2.00 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00 0.00 0.00 4.00 0.00 13.00 N6 F 0.00 0.00 0.00	0.00 0.00 0.00 5.00 6.00 4.00 0.00 N7 G 0.00 0.00 0.00	0.00 0.00 0.00 0.00 7.00 0.00 0.00 0.00
N2 N3 N4 N5 N6 N7 N8 N1 N2 N3 N4 N5	H B C D E F G A Labels: H B C D E	(1)[0,-]-(7)[2.00 N1 H 0.00 17.00 0.00 1.00 0.00 12.00 0.00 Iteration 7: (1)[0,-]-(5)[1.00 N1 H 0.00 17.00 0.00 2.00	,1]-(6)[2.00,7 N2 B 0.00 0.00 0.00 0.00 16.00 Breakthro ,1]-(7)[6.00,5 N2 B 0.00 0.00 0.00	0.00	[2.00,4] N4 D 0.00 2.00 0.00 6.00 1.00 4.00 [4.00,4]-{8}(7. N4 D 0.00 2.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	0.00 0.00 0.00 4.00 0.00 13.00 N6 F 0.00 0.00 0.00	0.00 0.00 0.00 5.00 6.00 4.00 0.00 0.00 0.00 6.00 5.00	0.00 0.00 0.00 0.00 7.00 0.00

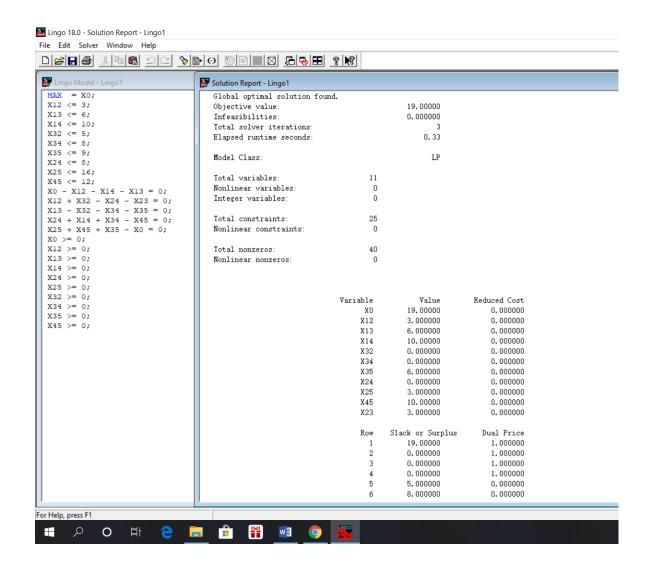
Maximum amount of material can be sent from node D to node A = 5+3+2+2+1 = 13

		Iteration 1							
		Starting Flow	Matrix						
		N1	N2	N3	N4	N5	N6	N7	N
		D	В	С	E	F	G	Н	
N1	D		2.00	0.00	1.00	5.00	3.00	0.00	2.0
N2	В	2.00		5.00	3.00	0.00	0.00	0.00	8.0
N3	С	0.00	5.00		2.00	0.00	0.00	10.00	0.0
N4	E	1.00	3.00	2.00		0.00	4.00	1.00	0.0
N5	F	5.00	0.00	0.00	0.00		2.00	0.00	10.0
N6	G	3.00	0.00	0.00	4.00	2.00	2.00	6.00	0.0
N7	Н	0.00	0.00	10.00	1.00	0.00	6.00	0.00	0.0
N8	A	2.00	8.00	0.00	0.00			0.00	0.0
110		2.00				10.00	0.00	0.00	
		Iteration 2:	Breakthr	ough flow =	= 5.00				
	Labels:	(1)[0,]-(5)[5.00	,1]-(8)[10.00	,5]					
		N1	N2	N3	N4	N5	N6	N7	N
		D	В	С	E	F	G	H	
N1	D		2.00	0.00	1.00	0.00	3.00	0.00	2.0
N2	В	2.00		5.00	3.00	0.00	0.00	0.00	8.0
N3	С	0.00	5.00		2.00	0.00	0.00	10.00	0.0
N4	E	1.00	3.00	2.00		0.00	4.00	1.00	0.0
N5	F	10.00	0.00	0.00	0.00		2.00	0.00	5.0
N6	G	3.00	0.00	0.00	4.00	2.00		6.00	0.0
N7	Н	0.00	0.00	10.00	1.00	0.00	6.00		0.0
N8	Α	2.00	8.00	0.00	0.00	15.00	0.00	0.00	
		_							
		Iteration 3:		ough flow =					
	Labels:	(1)[0,]-(6)[3.00							
		N1	N2	N3	N4	N5	N6	N7	N:
		D	В	С	Е	F	G	Н	- 1
N1	D		2.00	0.00	1.00	0.00	0.00	0.00	2.00
N2	В	2.00		8.00	3.00	0.00	0.00	0.00	5.00
N3	С	0.00	2.00		2.00	0.00	0.00	13.00	0.0
N4	E	1.00	3.00	2.00		0.00	4.00	1.00	0.0
N5	F	10.00	0.00	0.00	0.00		2.00	0.00	5.0
N6	G	6.00	0.00	0.00	4.00	2.00		3.00	0.0
N7	H	0.00	0.00	7.00	1.00	0.00	9.00		0.0
N8	Α	2.00	11.00	0.00	0.00	15.00	0.00	0.00	
		Itoration 4	Drockthe	ough flow-	2.00				
	Labalas	Iteration 4:		ough flow =					
	Labels:	(1)[0,]-(2)[2.00						NZ.	317
		N1	N2	N3	N4	N5	N6	N7	NE
Ne	D.	D	B	C 0.00	4.00	0.00	G 0.00	H	2.00
N1	D	4.00	0.00	0.00	1.00	0.00	0.00	0.00	2.00
N2	В	4.00	1.00	6.00	3.00	0.00	0.00	0.00	5.00
N3	С	0.00	4.00	2.00	2.00	0.00	0.00	11.00	0.00
N4	E	1.00	3.00	2.00		0.00	4.00	1.00	0.00
N5	F	10.00	0.00	0.00	0.00		4.00	0.00	3.00
N6	G	6.00	0.00	0.00	4.00	0.00		5.00	0.00
N7	H	0.00	0.00	9.00	1.00	0.00	7.00		0.00
N8	Α	2.00	11.00	0.00	0.00	17.00	0.00	0.00	

		Iteration 5:	Breakthro	ugh flow =	2.00				
	Labels:	(1)[0,]-(8)[2.00	,1]						
		N1	N2	N3	N4	N5	N6	N7	N8
		D	В	С	Е	F	G	H	- 1
N1	D		0.00	0.00	1.00	0.00	0.00	0.00	0.0
N2	В	4.00		6.00	3.00	0.00	0.00	0.00	5.00
N3	C	0.00	4.00		2.00	0.00	0.00	11.00	0.00
N4	E	1.00	3.00	2.00		0.00	4.00	1.00	0.00
N5	F	10.00	0.00	0.00	0.00		4.00	0.00	3.00
N6	G	6.00	0.00	0.00	4.00	0.00		5.00	0.00
N7	H	0.00	0.00	9.00	1.00	0.00	7.00		0.00
N8	Α	4.00	11.00	0.00	0.00	17.00	0.00	0.00	
		Iteration 6:	Breakthro	ugh flow =	1.00				
	Labels:	(1)[0,]-(4)[1.0	0,1]-(6)[4.00,4] [7][5.00,6] [[4.00,3]-(8)[5	.00,2]		
	Labels:					(4.00,3]-(8)[5 N5	.00,2] N6	N7	N
	Labels:	(1)[0,]-(4)[1.0	0,1]-(6)[4.00,4] [7][5.00,6] [3)[9.00,7]-(2)			N7 H	N
N1	Labels:	(1)[0,]-(4)[1.0 N1	0,1]-(6)[4.00,4 N2]-(7)[5.00,6]-(N3	3)[9.00,7]-(2) N4		N6		0.0
N1 N2		(1)[0,]-(4)[1.0 N1	0,1]-(6)[4.00,4 N2 B	N3 C	3)[9.00,7]-(2) N4 E	N5 F	N6 G	Н	0.0
	D	(1)[0,]-(4)[1.0 N1 D	0,1]-(6)[4.00,4 N2 B	(7)[5.00,6]-(N3 C 0.00	3)[9.00,7]-(2) N4 E 0.00	N5 F 0.00	N6 G 0.00	H 0.00	0.0 4.0
N2	D B	(1)[0,-]-(4)[1.0 N1 D	0,1]-(6)[4.00,4] N2 B 0.00	(7)[5.00,6]-(N3 C 0.00	3)[9.00,7]-(2) N4 E 0.00 3.00	N5 F 0.00 0.00	N6 G 0.00 0.00	0.00 0.00	
N2 N3	D B C	(1)[0,-]-(4)[1.0 N1 D 4.00	0,1)-(6)(4.00,4) N2 B 0.00	N3 C 0.00 7.00	3)[9.00,7]-(2) N4 E 0.00 3.00	N5 F 0.00 0.00	N6 G 0.00 0.00	0.00 0.00 12.00	0.0 4.0 0.0
N2 N3 N4	D B C	(1)[0,-]-(4)[1.0 N1 D 4.00 0.00 2.00	0,1)-(6)(4.00,4) N2 B 0.00 3.00 3.00	(7)[5.00,6]-(N3 C 0.00 7.00	3)[9.00,7]-{2) N4 E 0.00 3.00 2.00	N5 F 0.00 0.00	N6 G 0.00 0.00 0.00 3.00	0.00 0.00 12.00 1.00	0.00 4.00 0.00
N2 N3 N4 N5	D B C E	(1)[0,-]-(4)[1.0 N1 D 4.00 0.00 2.00 10.00	0,1]-(6)[4.00,4] N2 B 0.00 3.00 3.00 0.00	1,(7)[5.00,6]-(N3 C 0.00 7.00 2.00 0.00	3)[9.00,7]-(2) N4 E 0.00 3.00 2.00	N5 F 0.00 0.00 0.00	N6 G 0.00 0.00 0.00 3.00	H 0.00 0.00 12.00 1.00 0.00	0.0 4.0 0.0 0.0 3.0

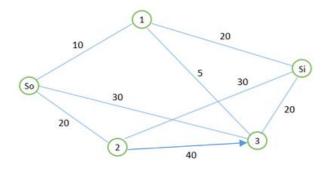
Since total cost are same, the company should purchase the materials from supplier at node H to obtain more material.

Q2. The maximum flow for the given network is obtained as 19 by using LINGO, which obtain the same answer with TORA.



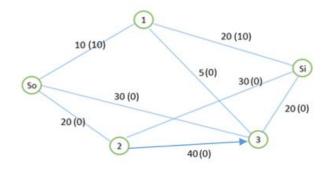
Q3. The amount of maximum flow from the source to sink is not always similar to the amount of maximum flow from sink to source for all network flow problems. When one of the arcs in the network is unidirectional, the amount of maximum flow from the source to sink will be different with the amount of maximum flow from sink to source.

Example shown as below:

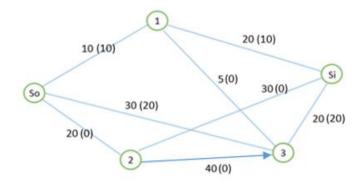


From Source to Sink

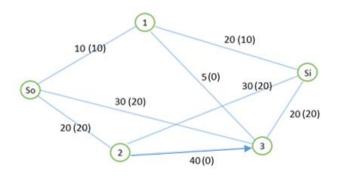
Iteration 1: So -1 - Si(10)



Iteration 2: So -3 - Si(20)



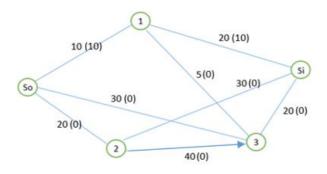
Iteration 3: So -2 - Si(20)



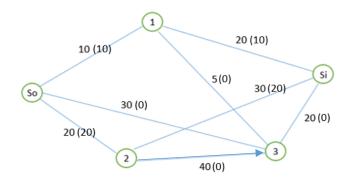
 \therefore Amount of maximum flow from source to sink = 10+20+20=50

From Sink to Source

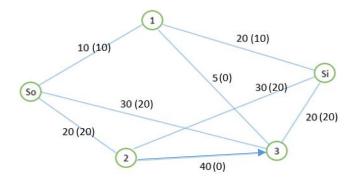
Iteration 1: Si - 1 - So (10)



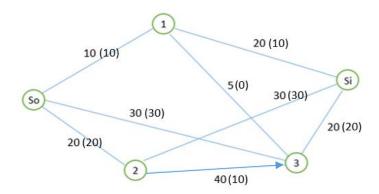
Iteration 2: Si - 2 - So (20)



Iteration 3: Si - 3 - So (20)



Iteration 3: Si - 2 - 3 - So (10)



 \therefore Amount of maximum flow from sink to source = 10+20+20+10=60

The amount of maximum flow from the source to sink is not always similar to the amount of maximum flow from sink to source for all network flow problems.