Q2

Time	8 AM	10	12 PM	2 PM	4	6	8 PM	10 PM
	x_1	x_1						
		x_2	x_2					
			x_3	x_3				
				x_4	x_4	x_4		
					x_5	x_5		
						x_6	x_6	
							x_7	
min^m volunteers	4	6	8	6	4	6	8	

$$\min Z = x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7$$

s.t.
$$x_1 \geq 4$$
$$x_1 + x_2 \geq 6$$
$$x_2 + x_3 \geq 8$$
$$x_3 + x_4 \geq 6$$
$$x_4 + x_5 \geq 4$$
$$x_5 + x_6 \geq 6$$
$$x_6 + x_7 \geq 8$$
$$(\text{all } x_1 \text{ to } x_7) \geq 0. \quad \text{i.e. } x_i \geq 0, \ \forall i = 1, 2, 3, 4, 5, 6, 7$$

Note:
It is said in problem that volunteer starting to work before 8pm, i.e. 8 AM, 10 AM, 12 PM, 2PM, 4PM and 6 PM will continue to work for 4 hrs. and volunteer starting at 8PM will work for 2 hrs.

→ So above set of objective function and constraints formulates our required LP problem to determine the optimal schedule for volunteers.

→ Here, x_1 suggests new volunteers starting at 8 AM
x_2 " " " " 10 AM
x_3 " " " " 12 PM
⋮
x_7 " " " " 8 PM

→ Note, that we do not schedule volunteers at 9 AM, 11 AM, 1 PM, 3 PM, 5 PM, 7 PM and 9 PM as we don't have new demand during that time and volunteer schedule is tabulated above in terms of x_1 to x_7.