Assignment - 4

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1. Bidder 1 - $b_1 \rightarrow s_1$ wallet

$b_2 \rightarrow s_2$

Prize :- $s_1 + s_2$

one bidder quits and other bidder pays P & receives $s_1 + s_2$

The equilibrium is the case where both players has to bid double price they have. (individual signal)

winner payment (P) < maximum he should pay

A bidder who wins at price p knows the actual value is $v = s_i + \frac{P}{2} > P$

if $P < 2s_i$ so i is pleased to be a winner at any price up to $2s_i$ but would lose money if he "won" the auction at any higher price. this is unique symmetric equilibrium.

If b_1 cons at p, then $V = S_1 + \frac{9p}{10} > p \iff p < 10 S_1$

if b_2 cons at $-p$ then $V = S_2 + \frac{p}{10} > p \iff p < \frac{10}{9} S_2$

2. Analyze the allocation algorithm for downward sloping valuation for following $v_i(k)$, values for buyer i.

$$v_{ik}(k) = v_{i1} + v_{i2} + \cdots + v_{ik}$$

k

$v_i(k)$	0	1	2	3	4	5	6	7	8	$\rightarrow v_i(k)$
1	0	50	100	140	180	210	230	240	250	
		50	50	40	40	30	20	10	10	
i 2	0	70	130	181	216	249	279	304	314	
		70	60	51	35	33	30	25	10	
3	0	60	110	150	190	225	251	276	301	
		60	50	40	40	35	26	25	25	

$n = 3$, $m = 8$

$$v_i(m_i) - v_i(m_i - 1) \geq p > v_i(m_i + 1) - v_i(m_i)$$

if $\sum m_i > m$ the p is too low

$\sum m_i < m$ then p is too high

otherwise we have found the right p

cleaning price in [0, v] is P

P	m_1	m_2	m_3	Σ
10	8	8	8	24
20	6	7	8	21
30	5	6	5	16
40	4	4	4	12
50	2	3	2	7
60	0	2	1	3
70	0	1	0	1

we calcolate the m_1, m_2, m_3 by

if $P=10$ $i=1$

$50-0 \geq 10 > (100-50)$ ✗ $(140-100) < 10 \leq (100-50)$ ✗

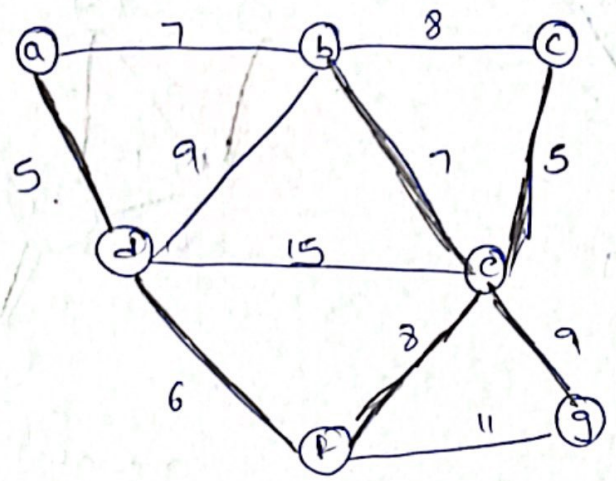
$140-100 \geq 10 > (180-140)$ ✗ $(210-180) \geq 10 \leq (180-140)$ ✗

$210-180 \geq 10 > 230-210$ ✗ $240-230 < 10 \leq 230-210$ ✗

$250-240 \geq 10 > 240-30$ ✗

soits 8

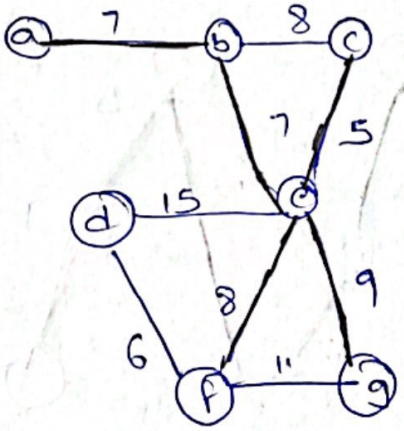
3. Minimum spanning tree



MST

Payments

AD



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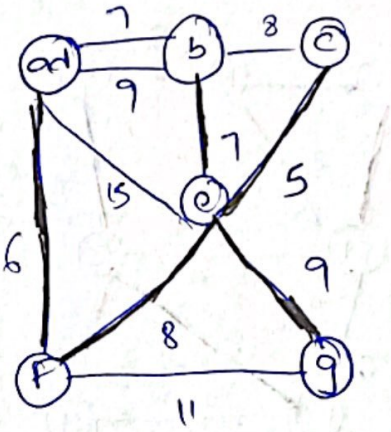

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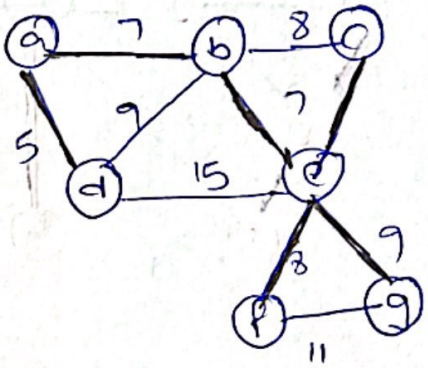

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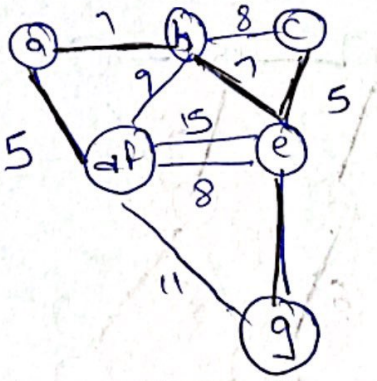

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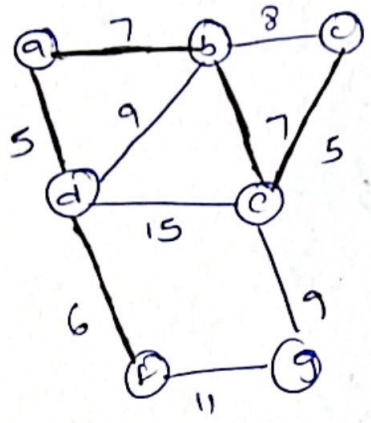

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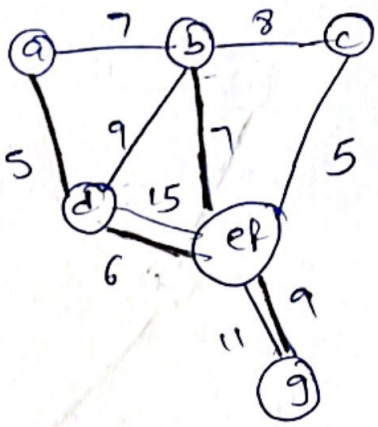

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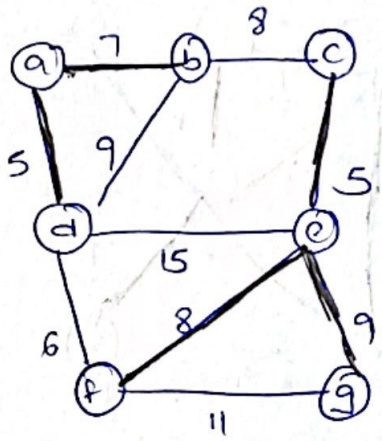

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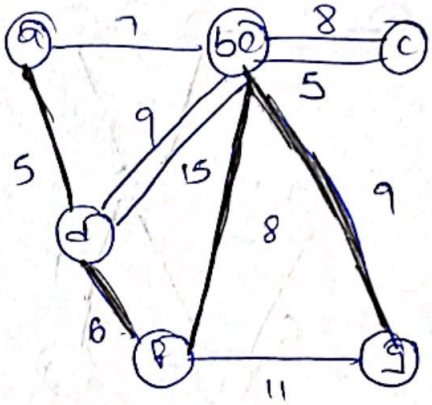

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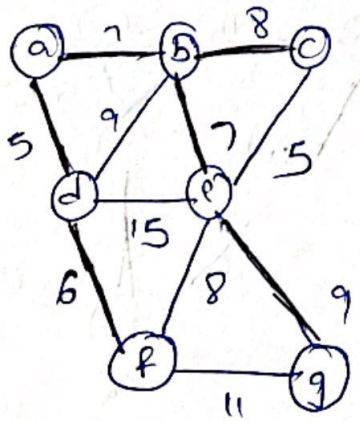

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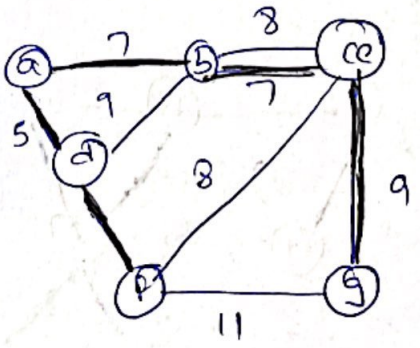

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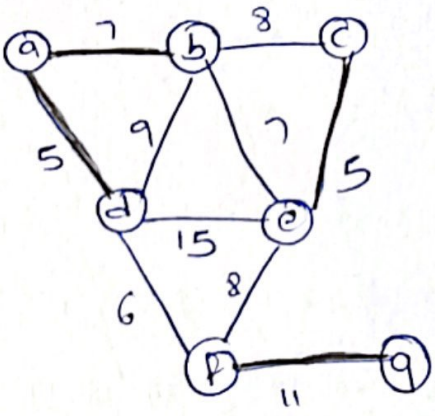
EG :-



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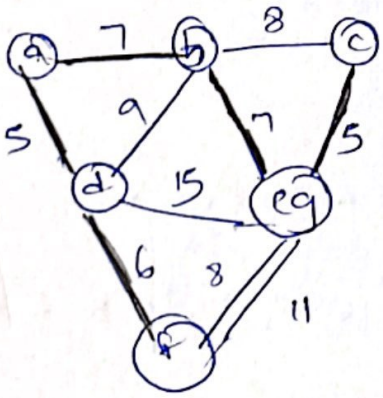

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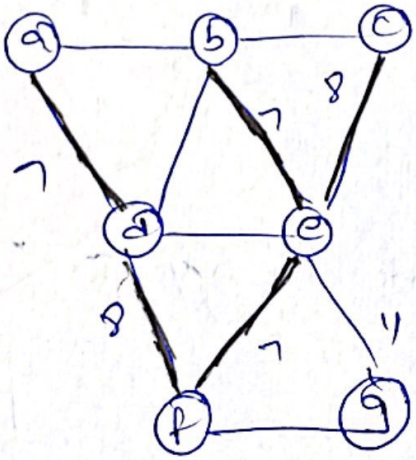

is the VCG payments for the minimum spanning tree for the above graph.

4.

i	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	10	9	8	6	6	5	5	5	5	5	5	4	4	2	2	2	2	1	1	1
Revenue	10	18	24	24	30	30	35	40	45	50	55	48	52	28	30	32	34	18	19	20

Conceptually order bids descending for obtaining optimal fixed-price and maximize price to fit first i bidders

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55 is the point where the revenues goes down