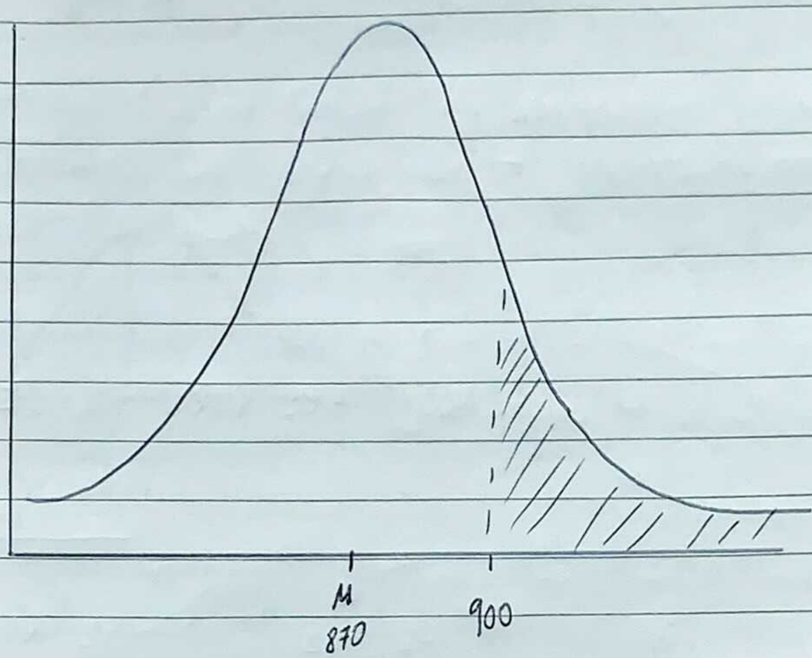
Question 1

$\mu = 870$

$\sigma = 70$

a)



$1 - (P(X > \mu))$

$z = \dfrac{(X - \mu)}{\sigma}$

$1 - (P(900 > 870))$

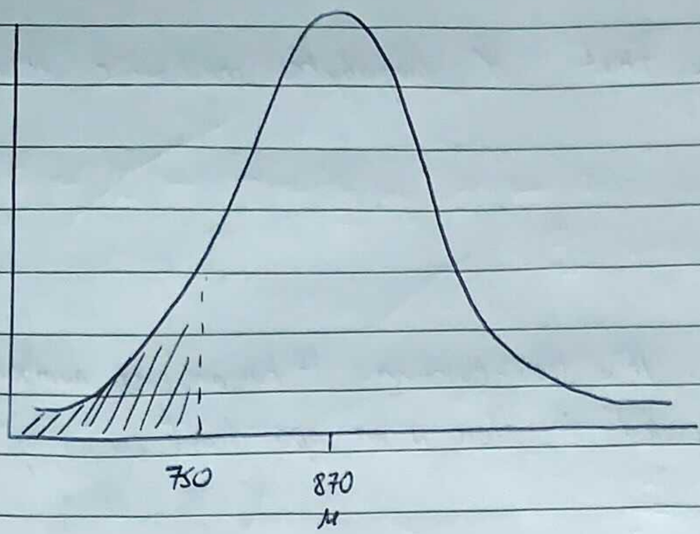
$z = \dfrac{(900 - 870)}{70}$

$z = 0.4286$

$z \approx 0.43 \therefore P = 0.6664$

$1 - 0.6664 = \boxed{0.3336}$

b)

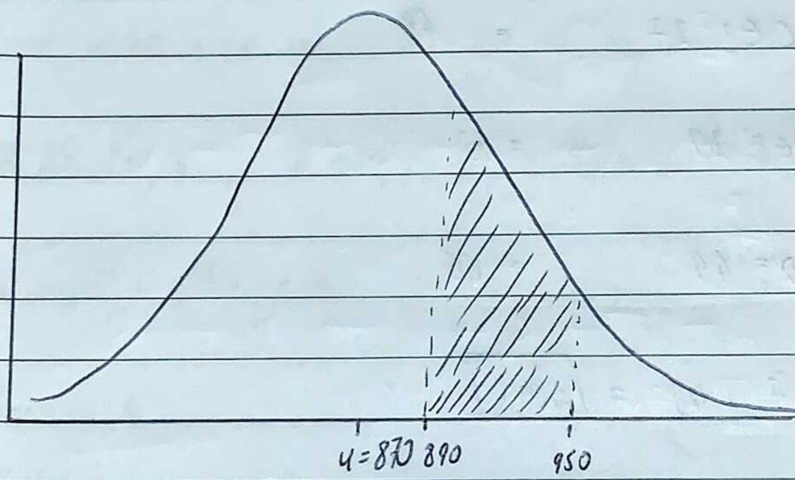


$P(x < \cancel{870}\ 750)$ $\quad z = \dfrac{(750 - 870)}{70}$ $\quad z = -1.714$

$\therefore P = 0.04363$

$P = \boxed{0.0436}$

c)



$P(890 < x < 950)$ $\quad z_1 = \dfrac{(950 - 870)}{70}$ $\quad z_2 = \dfrac{(890 - 870)}{70}$

$z_1 = 1.1429$ $\quad z_2 = 0.2857$

$P_{z_1} = 0.8729$ $\quad P_{z_2} = 0.6141$

$P(840 < x < 950) = P_{z_1} - P_{z_2} = 0.8729 - 0.6141$

$\boxed{P = 0.2588}$

357

1d) There is 0.25% chance that X megabytes shall arrive between 890 and 950 seconds.

Question 2

a) Figure 1 is not Eulerian. It is semi-eulerian. It has an even number of odd vertices and is fully connected ∴ there is an open trail containing every edge of the graph.

b) Σ weights = ~~384~~. 357 ODD vertices = B, C, D, E

Pairings

BD = 21 , CE = 27 = 48

BC = 23 , DE = 20 = 43

BE = 22 , CD = 44 = 66

Σ weight + Repeats = 357 + 43 = $\boxed{400}$

minimum route = A B H D I F D B E D E F G E C B C A

c) Total = 400

d) repeats = BC & DE. The graph is semi-eulerian.

Insert for Question 2

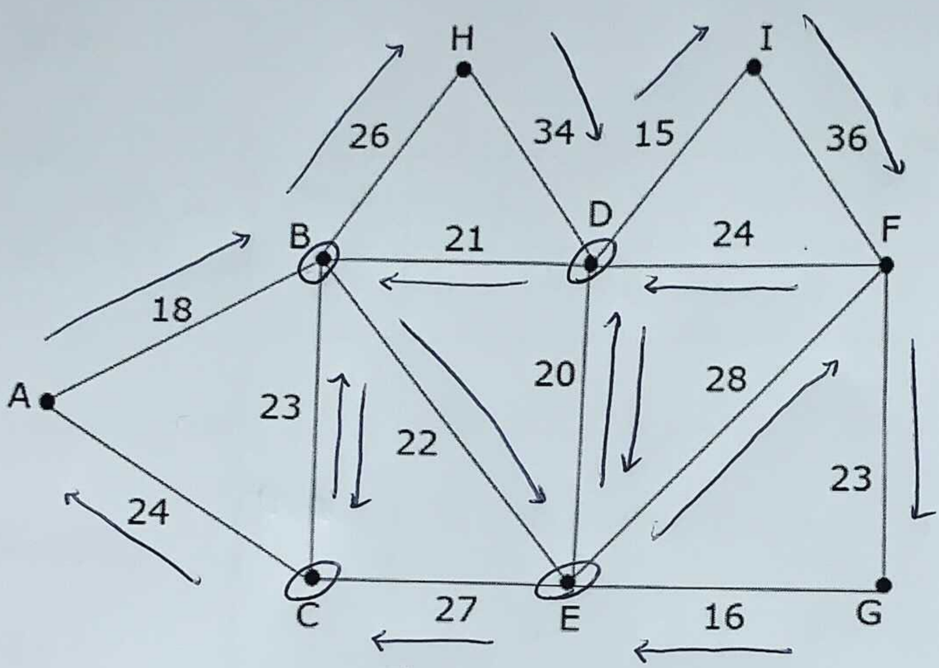


Figure 1

Question 3

a) $P = 2x + 2y + z$

$x - y \leq 8$

$-2y + 3z \leq 10$

$2x + 2y + z \leq 40$

b). They are slack variables to transform the inequality constraints into equality constraints. They are always = to 1.

c. see insert.

d). All values in the objective row are non-negative. ∴ optimal solution has been found.

e) $P = 435/7$, $x = 0$, $y = 85/7$, $z = 10/7$, $r = 141/7$, $s = 0$, $t = 0$

$P = 2x + 5y + z$

Question 4

a) see insert.

bi) see insert

ii) Select each row starting with P and select a column in Route matrix containing a vertex not already visited until you arrive a destination.

$$\underset{1}{P \rightarrow} \; \underset{1}{S \rightarrow} \; \underset{4}{R \longrightarrow} \; Q \quad = \boxed{6}$$

Insert for Question 3

Question 3

P	x	y	z	r	s	t	RHS
1	−2	−5	−1	0	0	0	0
0	1	−1	0	1	0	0	8
0	0	−2	3	0	1	0	10
0	2	4	1	0	0	1	40

		OC						
P	x	y	z	r	s	t	RHS	RATIO
1	-2	-5	-1	0	0	0	0	
0	1	-1	0	1	0	0	8	8
0	0	-2	3	0	1	0	10	5 ← smallest $\boxed{R3 = R3 \div -2}$
0	2	4	1	0	0	1	40	10

-2 is pivot element.

P	x	y	z	r	s	t	RHS		RATIO
1	-2	0	-8.5	0	5	0	50	$R1 = R1 + 5R3$	
0	1	0	-1.5	1	1	0	18	$R2 = R2 + R3$	12
0	0	1	-1.5	0	1	0	10	$R3$	6.67
0	2	0	7	0	-4	1	10	$R4 = R4 - 4R3$	1.42

Optimal Solution.

P	x	y	z	r	s	t	RHS	
1	$3/7$	0	0	0	$1/7$	$17/14$	$\frac{435}{7}$	$R1 = R1 + 8.5R4$
0	$10/7$	0	0	1	$1/7$	$5/14$	$141/7$	$R2 = R2 + 1.5R4$
0	$3/7$	1	0	0	$1/7$	$3/14$	$85/7$	$R3 = R3 + 1.5R4$
0	$2/7$	0	1	0	$-4/7$	$1/7$	$10/7$	$R4 = R4 \div 7$

Insert for Question 4a)

a)

D(0)

	P	Q	R	S	T
P	–	10	3	1	∞
Q	10	–	4	∞	3
R	3	4	–	1	2
S	1	∞	1	–	9
T	∞	3	2	9	–

R(0)

	P	Q	R	S	T
P	P	Q	R	S	T
Q	P	Q	R	S	T
R	P	Q	R	S	T
S	P	Q	R	S	T
T	P	Q	R	S	T

Insert for Question 4b)

D(2)

	P	Q	R	S	T
P	-	10	3	1	13
Q	10	-	4	11	3
R	3	4	-	1	2
S	1	11	1	-	9
T	13	3	2	14	-

R(2)

	P	Q	R	S	T
P	P	Q	R	S	Q
Q	P	Q	R	P	T
R	P	Q	R	S	T
S	P	P	R	S	T
T	Q	Q	R	Q	T

Insert for Question 4b)

D(3)

	P	Q	R	S	T
P	-	7	3	1	5
Q	7	-	4	5	3
R	3	4	-	1	2
S	1	5	1	-	3
T	5	3	2	3	-

R(3)

	P	Q	R	S	T
P	R	R	R	S	R
Q	R	Q	R	R	T
R	P	Q	R	S	T
S	P	R	R	S	R
T	R	Q	R	R	T

D(4)

	P	Q	R	S	T
P	-	6	2	1	4
Q	6	-	4	5	3
R	2	4	-	1	2
S	1	5	1	-	3
T	4	3	2	3	-

D(4)

	P	Q	R	S	T
P	P	S	S	S	S
Q	S	Q	R	R	T
R	S	Q	R	S	T
S	P	R	R	S	R
T	S	Q	R	R	T

D(5)

	P	Q	R	S	T
P	-	6	2	1	4
Q	6	-	4	5	3
R	2	4	-	1	2
S	1	5	1	-	3
T	4	3	2	3	-

R(5)

	P	Q	R	S	T
P	P	S	S	S	S
Q	S	Q	R	R	T
R	S	Q	R	S	T
S	P	R	R	S	R
T	S	Q	R	R	T

ci) See insert.

cii) Starting at P: route = P → S → R → T → Q → P
weight = 17

Start at S: route = S → P → R → T → Q → R → S
= 14

S: route = S → R → T → Q → P → S
= 17

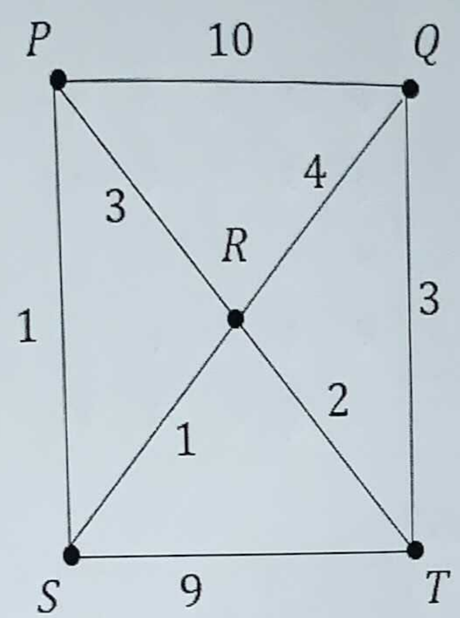
T: route = T → R → S → P → Q → T
= 17

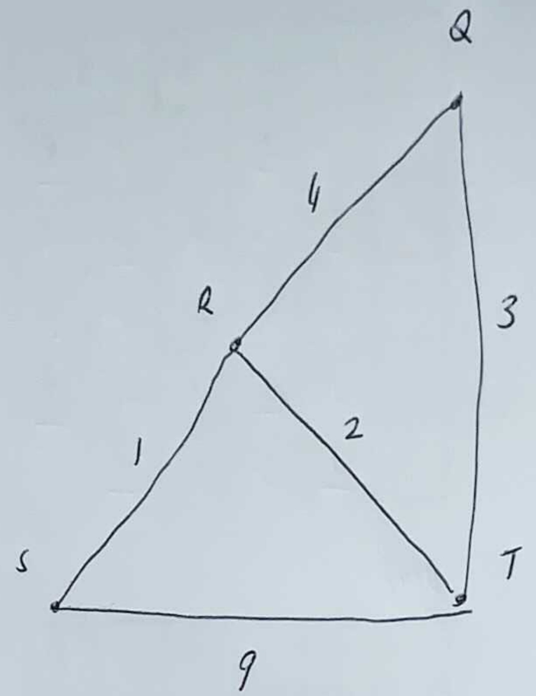
R: route = R → S → P → Q → T → R
= 17

Q: route = Q → T → R → S → P → Q
= 17

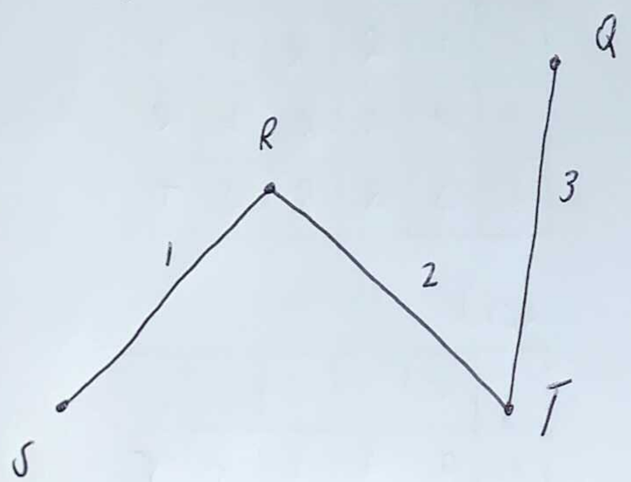
~~SPR TQRS~~
Lower bound = 17 (shortest route)

Insert for Question 4c)i)





ci) Using Kruskal's.



All vertices are connected

Lower bound = $\underline{\underline{6}}$

cii)