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Question 1

(a) E : Set of private universities

S : Set of all possible events

$$P(E) = \frac{|E|}{|S|}$$

$$= \frac{175}{500}$$

$$= \frac{7}{20}$$

$$= 0.35 \text{ //}$$

∴ Probability that a randomly selected student from the sample chose to study in a private university is 0.35

(b) L : Set of local universities

S : Set of all possible events

$$P(L) = \frac{|L|}{|S|}$$

$$= \frac{325}{500}$$

$$= \frac{13}{20}$$

$$= 0.65 \text{ //}$$

∴ Probability that a randomly selected student from the sample chose to study in a local public university is 0.65.

(c) A student can only choose one private university or one local public university at a time. It is impossible for a student studies both private university and local public university in a time.

Hence, the events "a student choose to study in private university" and "a student choose to study in local public university" are mutually exclusive because they cannot happent at the same time.

(d) - Probability of majoring in business-related field given that the students choose private universities, $P(B|E) = 0.6$

- Probability of majoring in business-related field given that the students who chose local public universities, $P(B|L) = 0.4$

- Probabity of chosing private universities given that majored in business-related fields, $P(E|B) = 0.7$

(i) $P(B|E) = \frac{P(B \cap E)}{P(E)}$

$0.6 = \frac{P(B \cap E)}{0.35}$

$P(B \cap E) = 0.21$ ✓

∴ Probability that a student chosen at random majored in a business-related field and choose a private university is 0.21.

(ii) By using law of Total Probability,

Probability of majored in a business-related field, $P(B)$

$= P(B \cap E) + P(B \cap L)$

$= P(B|E)P(E) + P(B|L)P(L)$

$= (0.6)(0.35) + (0.4)(0.65)$

$= 0.47$ ✓

∴ Probability that a student chosen at random majoret in a business-related field is 0.47.

(iii) $P(B|L) = \frac{P(B \cap L)}{P(L)}$

$0.4 = \frac{P(B \cap L)}{0.65}$

$P(B \cap L) = 0.4 \times 0.65$

$P(B \cap L) = \frac{13}{50}$

$P(B \cap L) = 0.26$ ✓

$$P(L|B) = \frac{(P(B|L)P(L))}{P(B|L)P(L)+P(B|P)P(P)}$$

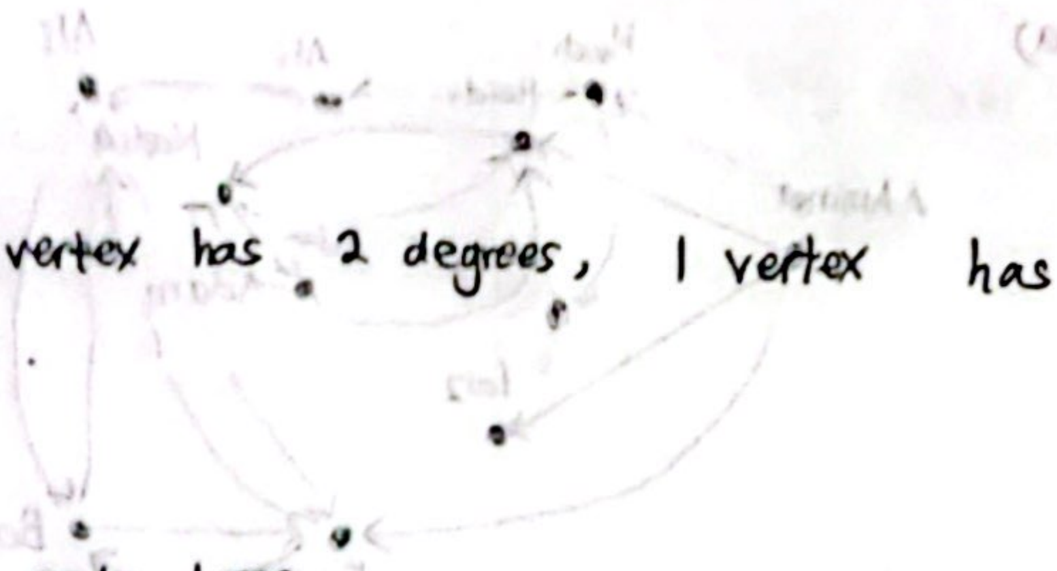
$$= \frac{0.4(0.65)}{(0.4)(0.65)+(0.6)(0.35)}$$

$=0.55$

∴ Probability that a student chosen at random majored in a business-related field but chosen a local public university is 0.26

Question 2

- Both graph have 6 vertices
- Both graph have 6 edges
- Both graph contain 1 vertex has 4 degrees, 1 vertex has 2 degrees, 1 vertex has 3 degrees and 3 vertices has 1 degree.
- Both graph are connected graph
- Both graph do not have paralled edges and loops



f(PEP) = PEP

f(PKLR) = PKM

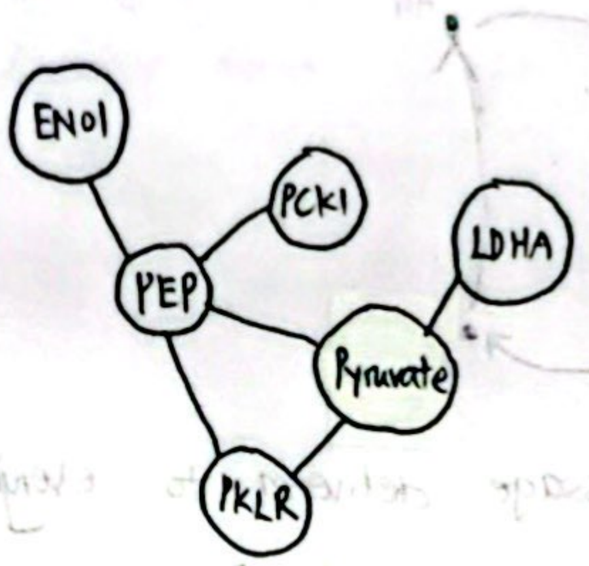
f(Pyruvate) = Pyruvate

f(LDHA) = LDHB

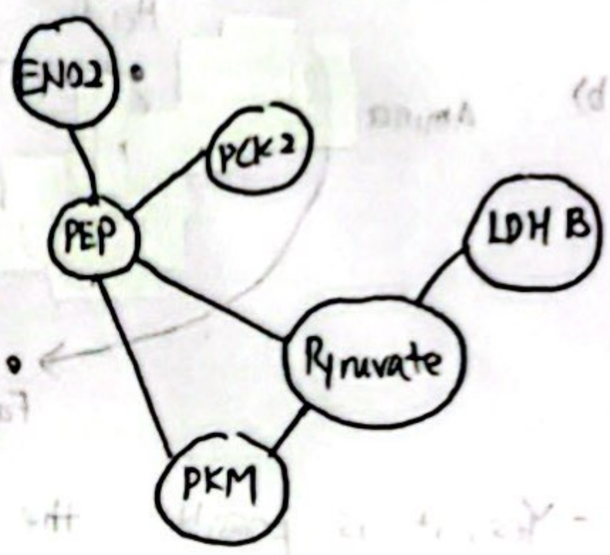
f(ENO1) = ENO2

f(PCK1) = PCK2

Graph of GLUCONEOGENESIS



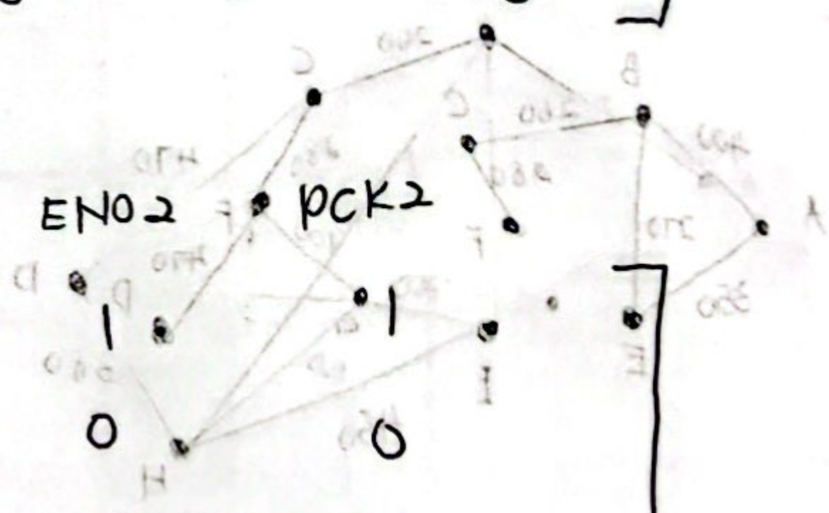
Graph GLYCOLYSIS



Adjacency matrix of graph GLUCONEOGENESIS :

	PEP	PKLR	Pyruvate	LDHA	ENO1	PCK1
PEP	0	1	1	0	1	1
PKLR	1	0	1	0	0	0
Pyruvate	1	1	0	1	0	0
LDHA	0	0	1	0	0	0
ENO1	1	0	0	0	0	0
PCK1	1	0	0	0	0	0

Adjacency matrix of graph GLYCOLYSIS :

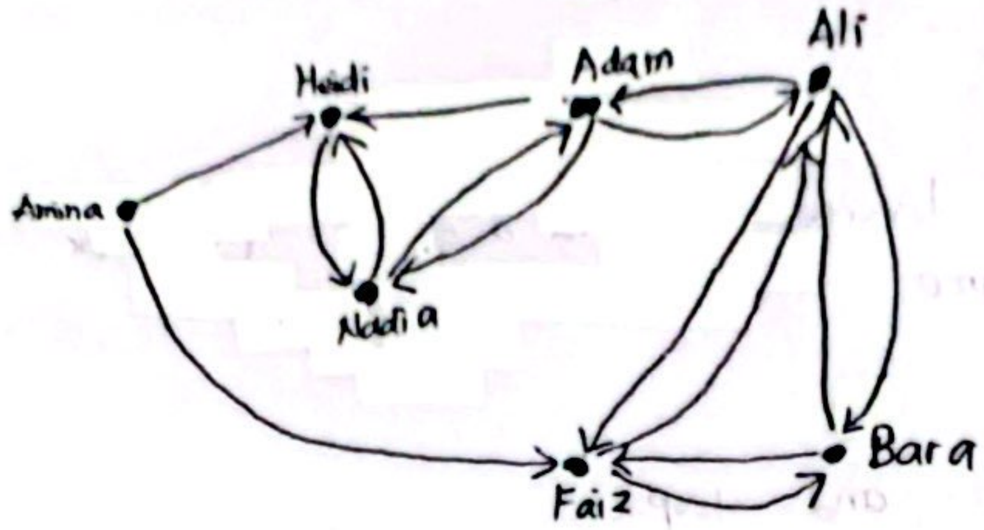


	PEP	PKM	Pyruvate	LDHB	ENO2	PCK2
PEP	0	1	1	0	1	1
PKM	1	0	1	0	0	0
Pyruvate	1	1	0	1	0	0
LHDB	0	0	1	0	0	0
ENO2	1	0	0	0	0	0
PCK2	1	0	0	0	0	0

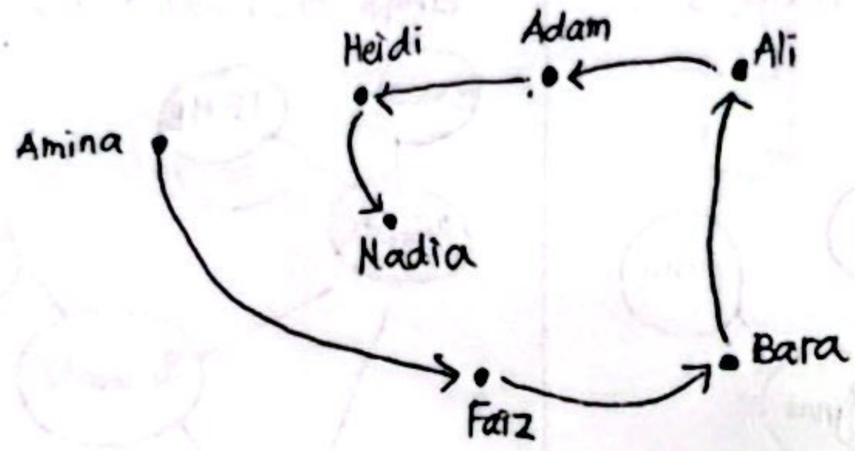
∴ Graph GLUCONEOGENESIS and graph GLYCOLYSIS are isomorphic. Both has same adjacency matrix.

Question 3

(a)



(b)



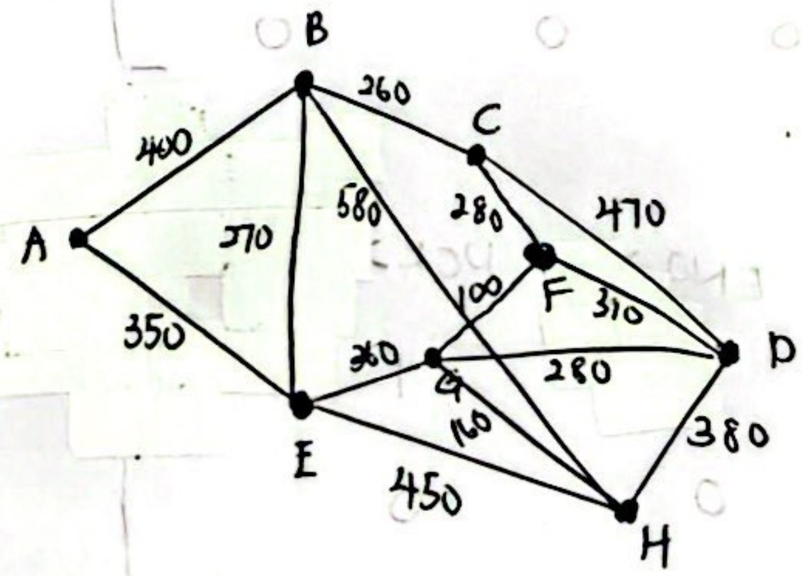
- Yes, it is possible the message delivered to everybody exactly once
- Execution of path flow of the communication:

  Amina, Faiz, Bara, Ali, Adam, Heidi, Nadia

(c) Friends or people act as Vertices while the path flow of the communication act as the vertex. It is possible the message delivered to everybody exactly once indicates that all vertex is used once, and selected edge is used only. This is characteristic of Hamilton

∴ The theorem implemented to solve problem in (b) is Hamilton path.

(d) (i)



(ii) deg(A) = 2

deg(B) = 4

deg(C) = 3

deg(D) = 4

deg(E) = 4

deg(F) = 3

deg(G) = 4

deg(H) = 4

Question 3

c)(iii)- It is possible to plan a trip that travels all sections of the railway line without traveling on any section of the line more than once.

- The railway line without travelling on any section of the line more than once and the towns can be visited more than once. This indicates that edge cannot be repeated and vertex can be repeated which is the characteristic of Euler.
- Since all the vertex has even degrees and only vertex C and vertex F have odd degrees, this indicates that vertex C and vertex F are the starting vertex and ending vertex.
- Execution :(C, 260, B, 400, A, 350, E, 450, H, 380, D, 310, F)

(iv) Close line from B to E can be closed because B and E are still connected indirectly through other routes.

(v)

S	N	L(A)	L(B)	L(C)	L(D)	L(E)	L(F)	L(G)	F(H)
{ }	{A,B,C,D,E,F,G,H}	0	∞	∞	∞	∞	∞	∞	∞
{A}	{B,C,D,E,F,G,H}		400	∞	∞	350	∞	∞	∞
{A,E}	{B,C,D,F,G,H}		400	∞	∞		∞	710	800
{A,E,B}	{C,D,F,G,H}			660	∞		∞	710	800
{A,E,B,C}	{D,F,G,H}				1130		940	710	800
{A,E,B,C,G}	{D,F,H}				990		810		800
{A,E,B,C,G,H}	{D,F}				990		810		
{A,E,B,C,G,H,F}	{D}				990				
{A,E,B,C,G,H,F,D}	{ }								

∴ Shortest route : A → E → G → D

Minimum total length of track to travel from Ash to Daisy

= 350 + 360 + 280

= 990