SCHOOL OF COMPUTING

SEMESTER 1, 2020/2021

SECI1013-07 STRUKTUR DISKRIT

(DISCRETE STRUCTURE)

SECTION: 07

ASSIGNMENT 04

GROUP: 02

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ANS NO 1

Here, $V(G) = \{1, 2, \ldots, 10\}$
if $|v - w| \leq 3$

According to given condition,

	1	2	3	4	5	6	7	8	9	10
1	0	1	1	1	0	0	0	0	0	0
2	1	0	1	1	1	0	0	0	0	0
3	1	1	0	1	1	1	0	0	0	0
4	1	1	1	0	1	1	1	0	0	0
5	0	1	1	1	0	1	1	1	0	0
6	0	0	1	1	1	0	1	1	1	0
7	0	0	0	1	1	1	0	1	1	1
8	0	0	0	0	1	1	1	0	1	1
9	0	0	0	0	0	1	1	1	0	1
10	0	0	0	0	0	0	1	1	1	0

So, the edge are, (1,2), (1,3), (1,4), (2,3), (2,4), (2,5), (3,4), (3,5), (3,6), (4,5), (4,6), (4,7), (5,6), (5,7), (5,8), (6,7), (6,8), (6,9), (7,8), (7,9), (7,10), (8,9), (8,10), (9,10)

So, $e(G) = 24$

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Answer to the question no- 2

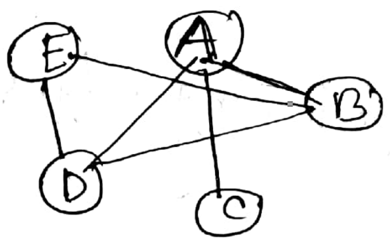
(a)

Let the vertics A, B, C, D, E of the graph represent the people Ahmed, Bakre, Chong, Devid, Ehsan respectively.

Now, two vertices are adjacent (that is there is an edge between them) if the corresponding people are friends,

thus we have the following edges:

(A, B), (A, D), (A, C), (D, B), (D, E), (B, E)



Graph

The adjacency matrix is:

$$a_{5\times5} = \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

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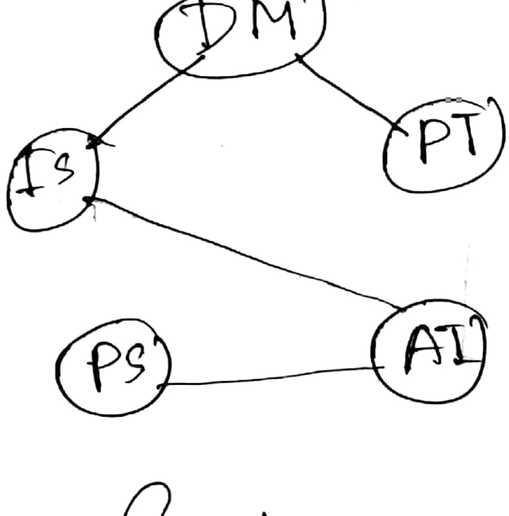
(b)

Let the vertices DM, PT, AI, PS, IS represent the subject Discrete Math, Programming Technique, Artificial Intelligence Probability statistics, Information system respectively.

so,
Two vertices are adjacent (There is an edge between them) if the corresponding subjects ~~an~~ can't be scheduled in the same time ~~slot~~ slot.

Thus, We have the following edges = {(DM, IS), (DM, P.T), (AI, P.T), (IS, AI)}



Graph

The adjacency matrix is as following

$$\alpha_{5\times5} = \begin{bmatrix} 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix}$$

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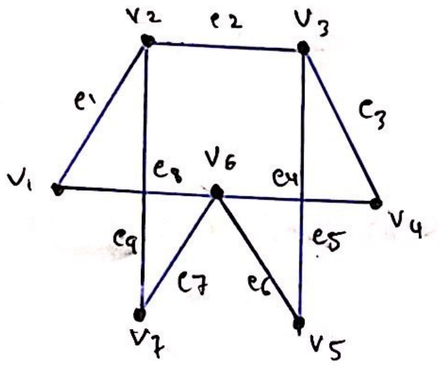
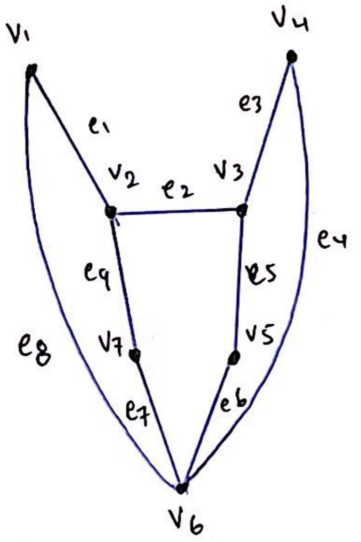
Q3

Show that the 2 drawing represent the same graph by labeling the vertices and edges of the righ-hand drawing to correspand to left-hand drawing.





∴ shown

ANS NO 4

Adjacency and incidence matrices of graph 'G'

$$\begin{array}{c|c} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

Adjacency matrix

$$\begin{array}{c|c} & \begin{matrix} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 2 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix} \end{array}$$

incidence matrix

Adjacency and incidence matrices of graph 'H'

$$\begin{array}{c|c} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 2 \\ 0 & 1 & 1 & 0 \\ 0 & 2 & 0 & 0 \end{bmatrix} \end{array}$$

Adjacency matrix

$$\begin{array}{c|c} & \begin{matrix} e_1 & e_2 & e_3 & e_4 & e_5 & e_6 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 2 & 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix} \end{array}$$

incidence matrix

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Answer to the question no-5

(a)

G_1 and G_2 are isomorphic.

Explanation:
Through the following re-labelling of the vertices, we can ~~see~~ ~~th~~ ing this picture isomorphism.

$v_1 \longrightarrow v_5$
$v_2 \longrightarrow v_3$
$v_3 \longrightarrow v_2$
$v_4 \longrightarrow v_4$
$v_5 \longrightarrow v_1$

(b)

H_1 and H_2 are not isomorphic.

Explanation:-
The vertix with the loop in H_1 has two other adjacent vertices & while the ~~other~~ one is H_2 only has 1 other adjacent vercices. Hense, the graph can't be isomorphic.

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Q6

no repeated e
↳ no v

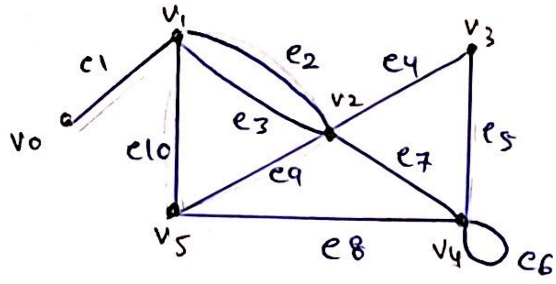
no repeated V
↳ no rep e

closed trails

closed path

Determine wheter trails, path, closed walks, circuits/cycles, simple circuits or just walks. ↳ a - a

↳ no loop
- undirected
- no multiple edge.



a) $v_0\ e_1\ v_1\ e_{10}\ v_5\ e_9\ v_2\ e_2\ v_1$

↳ trail

b) $v_4\ e_7\ v_2\ e_9\ v_5\ e_{10}\ v_1\ e_3\ v_2\ e_9\ v_5$

↳ walk

c) v_2 → trail

d) $v_5\ e_9\ v_2\ e_4\ v_3\ e_5\ v_4\ e_6\ v_4\ e_8\ v_5$

↳ circuit

e) $v_2\ e_4\ v_3\ e_5\ v_4\ e_8\ v_5\ e_9\ v_2\ e_7\ v_4\ e_5\ v_3\ e_4\ v_2$

↳ closed walk

f) $v_3\ e_5\ v_4\ e_8\ v_5\ e_{10}\ v_1\ e_3\ v_2$

↳ walk

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No.

Date

ANS NO 7

ⓐ 3 path : $v_1\ e_1\ v_2\ e_2\ v_3\ e_5\ v_4$ ($v_1 \to v_4$)
: $v_1\ e_1\ v_2\ e_3\ v_3\ e_5\ v_4$ ($v_1 \to v_4$)
: $v_1\ e_1\ v_2\ e_4\ v_3\ e_5\ v_4$ ($v_1 \to v_4$)

ⓑ 6 trails : $v_1 e_1 v_2 e_2 v_3 e_4 v_2 e_3 v_3 e_5 v_4$
: $v_1 e_1 v_2 e_3 v_3 e_4 v_2 e_2 v_3 e_5 v_4$
: $v_1 e_1 v_2 e_4 v_3 e_2 v_2 e_3 v_3 e_5 v_4$

ⓒ Since there is no limit for length of walk, thus the walk is unlimited number.

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Answer to the question no-8

(a)

Graph (a) has Euler circuit since all vertices have even degree and travels ~~every~~ every edge only once

$(v_1 e_1 v_2 e_2 v_5 e_7 v_4 e_6 v_5 e_3 v_2 e_4 v_3 e_5 v_4 e_8 v_1)$

(b)

Graph (b) doesnot have Euler circuit, since not all vertices have even degree.

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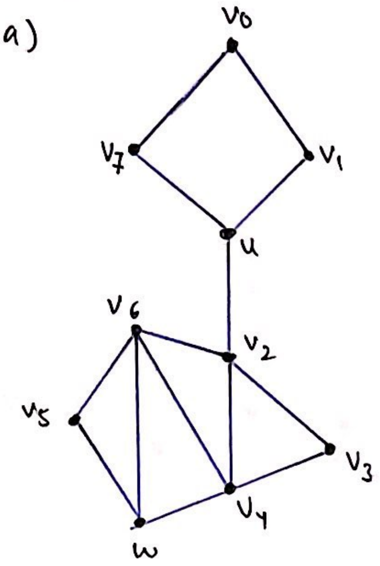
Q9

a)

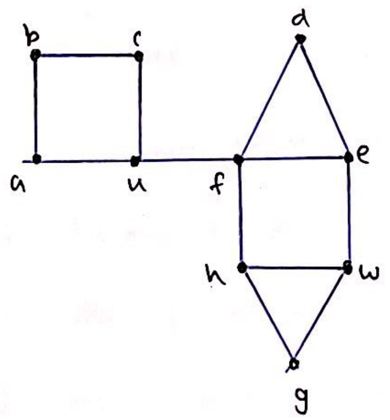


→ yes

→ ~~u, v1, v0, v7~~

u v1 v0 v7 v2 v3 v4 v2 v6 v4 w v5 v6 w

b)



→ no

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ANS NO 10

The Hamiltonian path exist vertex exactly once.
In (a) and (b) there are more than one connected cycles.

Therefore, In the graph (a)-(b),
∴ There won't exist any Hamiltonian path.

ANS NO 13

From the Figure 1,

Preorder : a, b, e, k, l, m, f, g, n, r, s, c, d, h, o i, j, p, q.

Postorder : k, L, m, e, f, r, s, n, g, b, c, o, h, i, p q, j, d, a

Inorder : k, e, l, m, b, f, g, r, n, s, a, c, o, h, d, i, p, j, q

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Answer to the question no- 11

Let's say that a full m-ary tree with n vertices has $l = \frac{(m-1)n+1}{m}$ leaves.

Suppose, T is a full 3-ary with 100 vertices.

Here, $m=3$, $n=100$

The tree, T has $l = \frac{(m-1)n+1}{m}$ leaves.

$= \frac{2 \times 10 + 1}{3}$

$= 67$ leaves.

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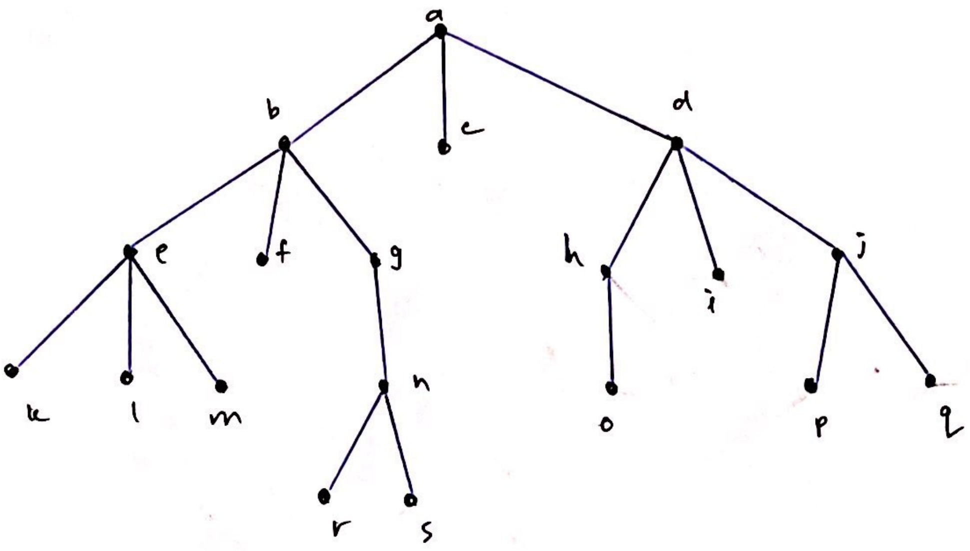
Q12



a) root - a

b) Internal vertices - a, b, d, e, h, j, n, g

c) Leaves - c, f, i, k, l, m, r, s, o, p, q

d) Children of n - r, s

e) Parent of e - b

f) Siblings of k - l, m

g) Proper ancestors of q - a, d, j, q

h) Proper descendants of b - e, f, g, k, l, m, n, r, s

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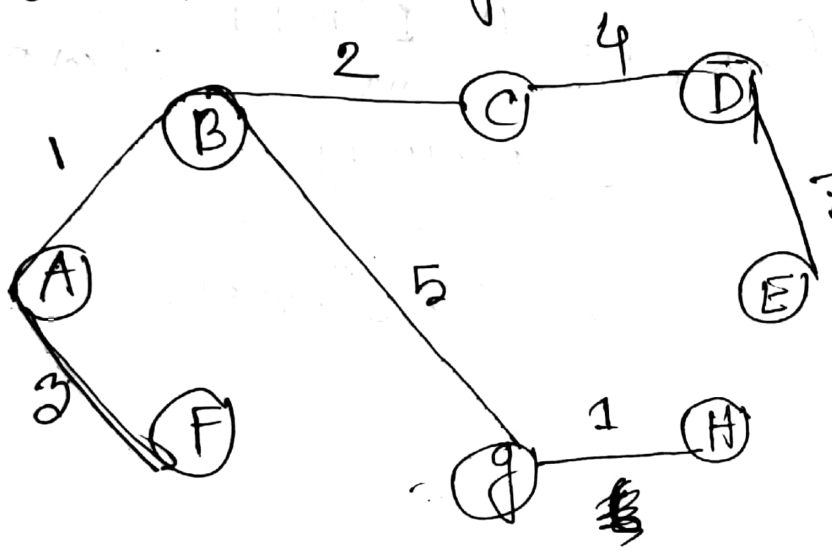
Answer to the question no-14

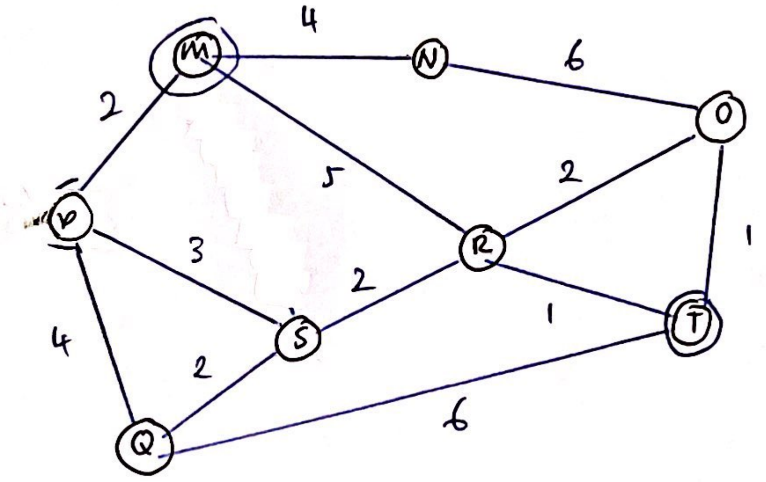
The minimum spanning tree for the following graph using Kruskal's algorithm (No cycles)

The graph contains 8 vertices and 13 edges. So, the minimum spanning tree formed will be having (8-1) 7 edges.



so, minimum spanning = (1+3+2+4+7+5+1)
= 23

Q15



M → T

V	M	P	N	Q	S	R	O	T
M	$\boxed{0m}$	2m	4m	∞	∞	5m	∞	∞
P		$\boxed{2m}$	4m	6p	5p	5m		
N			$\boxed{4m}$	6p	5p	5m	10N	
R						$\boxed{5m}$		6R

* Shortest path from M to T, having weigh 6 is M - R - T