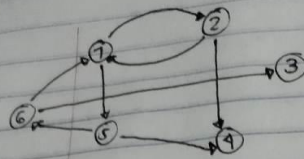


Activity on Graphs



$$G_9 = (V_{G_9}, E_{G_9})$$

$$V_{G_9} = \{1, 2, 3, 4, 5, 6\}$$

$$E_{G_9} = \{(1, 2), (2, 1), (1, 5), (2, 4), (5, 4), (5, 6), (6, 1), (6, 3)\}$$

$$V = \{1, 5, 4\} \text{ length is } 2$$

$$V = \{1, 5, 6, 3\} \text{ length is } 3$$

Indegree of :

$$1 : V = (2, 6)$$

$$2 : V = 1$$

$$3 : V = 6$$

$$4 : V = (2, 5)$$

$$5 : V = 1$$

$$6 : V = 5$$

Outdegree of :

$$1 : V = (2, 5)$$

$$2 : V = (1, 4)$$

$$3 : V = \text{none}$$

$$4 : V = \text{none}$$

$$5 : V = (4, 6)$$

$$6 : V = (1, 3)$$

Simple cycle :

1 and 2

1, 5 and 6

The vertices adjacent to node 1 are nodes 2 and 6

The vertices adjacent from node 1 are nodes 2 and 5

The edges incident to node 1 are $(1, 2), (2, 1), (1, 5), (6, 1)$

The vertex adjacent to node 2 is node 1

The vertices adjacent from node 2 are nodes 1 and 4

The edges incident to node 2 are $(2, 1), (1, 2), (2, 4)$

The vertex adjacent to node 3 is node 6

The vertex adjacent from node 3 is none

The edges incident to node 3 is $(3, 6)$

The vertices adjacent to node 4 are nodes 2 and 5

The vertex adjacent from node 4 is none

The edges incident to node 4 are $(2, 4), (5, 4)$

The vertex adjacent to node 5 is node 1

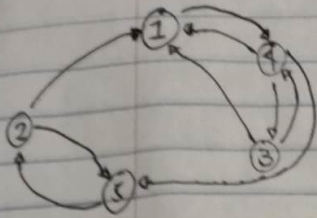
The vertices adjacent from node 5 are nodes 4 and 6

The edges incident to node 5 are $(5, 4), (5, 6), (1, 5)$

The vertex adjacent to node 6 is node 5

The vertex adjacent from node 6 are nodes 1 and 3

The edges incident to node 6 are $(6, 1), (6, 3), (5, 6)$



$$G_{10} = (V_{G10}, E_{G10})$$

$$V_{G10} = \{1, 2, 3, 4, 5\}$$

$$E_{G10} = \{(1, 4), (2, 1), (2, 5), (3, 1), (3, 4), (4, 1), (4, 3), (4, 5), (5, 2)\}$$

Indegree of:

$$1 : V = \{2, 3, 4\}$$

$$2 : V = \{5\}$$

$$3 : V = \{4\}$$

$$4 : V = \{1, 3\}$$

$$5 : V = \{2, 4\}$$

Outdegree of:

$$1 : V = \{4\}$$

$$2 : V = \{1, 5\}$$

$$3 : V = \{1, 4\}$$

$$4 : V = \{1, 3, 5\}$$

$$5 : V = \{2\}$$

Simple cycle:

$$1, 4, \text{ or } 3$$

$$1, 4, 5, \text{ or } 2$$

$$2 \text{ or } 5$$

The vertices adjacent to node 1 are nodes 2, 3, 4

The vertices adjacent from node 1 is node 4

The edges incident to node 1 are $(1, 4), (4, 1), (3, 1), (2, 1)$

The vertices adjacent to node 2 is 5

The vertices adjacent from node 2 are nodes 1 and 5

The edges incident to node 2 are $(2, 1), (2, 5), (5, 2)$

The vertices adjacent to node 3 is node 4

The vertices adjacent from node 3 are nodes 1 and 4

The edges incident to node 3 are $(3, 1), (3, 4), (4, 3)$

The vertices adjacent to node 4 are nodes 1 and 3

The vertices adjacent from node 4 are nodes 1, 3, 5

The edges incident to node 4 are $(1, 4), (4, 1), (4, 3), (3, 4), (4, 5)$

The vertices adjacent to node 5 are nodes 2 and 4

The vertices adjacent from node 5 is node 2

The edges incident to node 5 are $(5, 2), (2, 5), (4, 5)$

Short Quiz on Trees (cont'd.)

Given the tree to the right, identify the ff.:

6. Children of node 16.

- nodes 13, 6, 60

7. Parent of node 1.

- 7

8. Siblings of 23.

- none

9. Ancestors of 9.

- nodes 22, 7, 12, 4

10. Descendants of 16.

- nodes 13, 6, 60

11. Leaves.

- nodes 23, 6, 21, 20, 9, 1

12. Non-leaves.

- nodes 22, 16, 7, 13, 60, 12, 4

13. Depth of node 4.

- node 4 has depth 3

14. Degree of the tree.

- this tree has degree 3

15. Height of the tree.

- this tree has height 4

16. Weight of the tree.

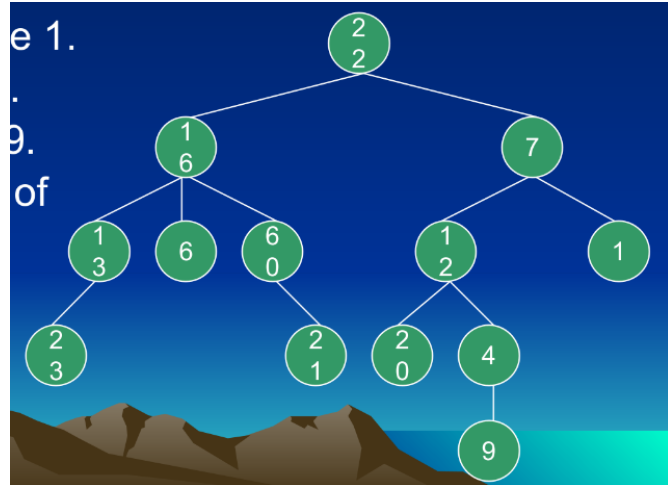
- the weight of this tree is 6

17. Is the tree a binary tree?

- No

18. Removing 6, is the tree a full binary tree?

- Yes



19. Removing 6, is the tree a complete binary tree?

- Yes

20. Is a full binary tree complete?

- No

21. Is a complete binary tree full?

- Yes

22. How many leaves does a complete n-ary tree of height h have?

$$k=3, h=4$$

$$k^h = 3^4 = 81$$

23. What is the height of a complete n-ary tree with m leaves?

$$(\log_m n) = \log 3^6 = 1.6309$$

24. What is the number of internal nodes of a complete n-ary tree of height h?

$$k^h - 1 / k - 1 = 3^4 - 1 / 3 - 1 = 40$$

25. What is the total number of nodes a complete n-ary tree of height h have?

$$[(k^{h+1}) - 1] / (k - 1)$$

$$[(3^{4+1}) - 1] / (3 - 1) = 80.67 \text{ or } 81$$