

Show all your work.

1. Draw the graph represented by the adjacency matrix. (5 points)
- | | <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> | <i>E</i> |
|----------|----------|----------|----------|----------|----------|
| <i>A</i> | 2 | 0 | 0 | 1 | 0 |
| <i>B</i> | 0 | 0 | 1 | 0 | 1 |
| <i>C</i> | 0 | 1 | 2 | 1 | 1 |
| <i>D</i> | 1 | 0 | 1 | 0 | 0 |
| <i>E</i> | 0 | 1 | 1 | 0 | 0 |

2. Find a recurrence relation and initial conditions that generate a sequence that begins with the given terms. (4 points each)

a. 2, 4, 6, 8, 10, ...

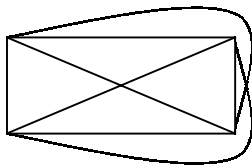
b. 1, 3, 6, 10, 15, 21, ...

3. Solve the given recurrence relation: $a_n = 6a_{n-1} - 9a_{n-2}$, $a_0 = a_1 = 1$ (8 points)

4. a. Decode the bit string using the Huffman code given: 0111010011110001110 (4 points)

b. Using the code given above, code the word PLANS. (4 points)

5. Find an Euler cycle for the given graph, if possible. If not possible, explain why. If it is possible number the edges of your path so I can easily follow it. (5 points)



6. Find a shortest path in the weighted graph from A to J and give its length. (5 points)

7. Determine if G_1 and G_2 are isomorphic. If so, find a mapping from one graph to the other. If not, give an invariant that the graphs do not share. (6 points each)

a.

b.

8. Answer the questions below using the given tree. (2 points each)

a. Find the parent(s) of j.

b. Find the descendant(s) of c.

c. Find the child(ren) of c.

d. Find the sibling(s) of h.

9. Draw a graph having the given properties, if possible. If not possible, explain why. (4 points each)
- Six edges; eight vertices
 - Acyclic; four edges, six vertices
 - Four edges; four vertices having degrees 1, 2, 3, 4
10. Assume that a person invests \$4000 at 17 percent interest compounded annually. Let A_n represent the amount at the end of n years. Find a recurrence relation and an initial condition for the sequence A_0, A_1, \dots (5 points)
11. Use the graph to the right to find the following, if they exist: (4 points each)
- Parallel edges
 - An edge incident on v_3 .
 - A simple path from v_1 to v_4 .
 - A cycle from v_2 to v_2 .
 - A simple cycle from v_2 to v_2 .
 - Write the incidence matrix for the graph.