Problem 1

Given the graph G(V,E) below:

(a) Show a minimum clique cover.
(b) Draw the complement graph.
(c) Color the complement graph with the smallest number of colors.
(d) Is this a perfect graph?

Problem 2

We change the graph G(V,E) in Problem 1 to a Directed Acyclic Graph (DAG) G(V,E,W) below:

Consider vertex V₀ as the source and vertex V₇ as the sink. Find the shortest path from V₀ to V₇ by applying the following algorithms:
(a) Dijkstra algorithm.
(b) Bellman-Ford algorithm.

**Problem 3**

Write the Control-Flow Expression that executes the three programs in parallel.

**Code 1**

```plaintext
if !a then
    while b do
        P1;
    end while
else
    P3;
end if
```

**Code 2**

```plaintext
wait a
P2;
while b do
    P3;
end while
```

**Code 3**

```plaintext
always {
    if a then
        P4;
    else
        P2;
    end if
}
```

**Problem 4**

Given the following equations:

\[ h = f + g \]
\[ f = (a \times b \times c + d) \times e \]
\[ g = a + b \times c + b \times c \times d \times e \]
(a) Draw the data-flow graph. Assume all additions and multiplications can have only 2 inputs.

(b) Apply tree height reduction to the data-flow graph drawn in (a).

(c) Assume that $a=8$, $b=10$, $c=2$ and $d=5$ are constant. Apply constant propagation and operator strength reduction. Draw the resulting data-flow graph.