

Sample Exam

*Closed book and notes; In class**Fri, Feb 25th*

- ⊕ *Do not forget to write your name on the first page. Initial each subsequent page.*
- ⊕ *Be **neat** and **precise**. We will not grade answers I cannot read.*
- ⊕ *You should draw simple figures if you think it will make your answers clearer.*
- ⊕ *Good luck and remember, brevity is the soul of wit*

- All problems are mandatory
- I cannot stress this point enough: **Be precise**. If you have written something incorrect along with the correct answer, you should **not** expect to get all the points. We will grade based upon what you **wrote**, not what you **meant**.
- Maximum possible points: 50.

Name: _____

Problem	Points
1	
2	
3	
4	
5	
Total	

1. Run the stable marriage algorithm on the following instance to create a stable marriage. Show **all** your steps. (10 points)

Instance: There are 4 men, m_1, m_2, m_3, m_4 and 4 women, w_1, w_2, w_3, w_4 . Following are the preference lists for the 4 men:

- $m_1 : [w_2, w_1, w_4, w_3]$
- $m_2 : [w_1, w_4, w_2, w_3]$
- $m_3 : [w_1, w_2, w_3, w_4]$
- $m_4 : [w_4, w_3, w_1, w_2]$

Preference list for the women are as follow:

- $w_1 : [m_2, m_3, m_1, m_4]$
- $w_2 : [m_3, m_1, m_2, m_4]$
- $w_3 : [m_4, m_2, m_1, m_3]$
- $w_4 : [m_2, m_4, m_1, m_3]$

2. Use Euclid's GCD algorithm to compute the GCD of the pair $(66, 120)$. Show all your steps. (10 points)

3. Graph Problems

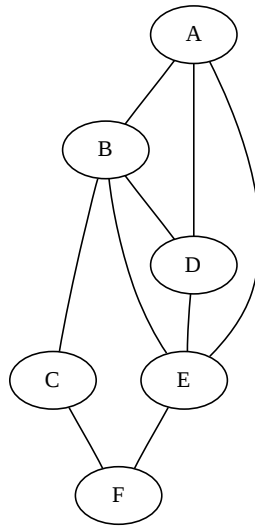


Figure 1: A graph with 6 nodes and 9 edges

- Which vertices have maximum degree? (2 points)
- Which vertices have minimum degree? (2 points)
- Suppose we wish to generate “friend suggestions” for nodes that are not neighbors but have at least one neighbor in common, then which pairs should we generate? (6 points)

4. (a) Write a ruby program to sum up all the elements of a given array A .

- (b) What does the following program output? (5 points)

```
A=Array[3,-1,2,-4,7,6]
sum1=0
sum2=0

A.length.times{|i|
  if (A[i]>0) then
    sum1=sum1+1
  elsif (A[i]<0) then
    sum2=sum2+1
  end
}

print(' '#{sum1} and '#{sum2}')
```

5. Programming in Ruby

- (a) Fill in details of this section of code that swaps the values of two variables (4 points)

```
# Assume a and b are two variables that you want to swap
# put your code in the space below
```

```
# the values contained in a and b have been swapped
```

- (b) Write a function that takes an array (containing integers) as input, and returns 1 if and only all the numbers in the array are strictly positive. (6 points)

```
def allPositive(a)
  # a is an array
  # return 1 if all of a[i] > 0
  # 0 otherwise
```

```
end
```