UNIVERSITY OF MANITOBA

DATE: June 17, 2005
PAPER # 22
DEPARTMENT & COURSE NO: 136.101
EXAMINATION: Applied Finite Math

FINAL EXAMINATION
TITLE PAGE
TIME: 2 hours
EXAMINER: R. Borgersen

NAME: (Print in ink) _____

STUDENT NUMBER: _____

SEAT NUMBER: _____

SIGNATURE: (in ink) _____
(I understand that cheating is a serious offense)

INSTRUCTIONS TO STUDENTS:

This is a 2 hour exam. **Please show your work clearly.**

No texts, notes, or other aids are permitted. Simple calculators are permitted, but cellphones, electronic translators, and other electronic devices are not permitted.

This exam has a title page, 11 pages of questions, including 2 blank pages for rough work. Please check that you have all the pages. You may remove the blank pages if you want, but be careful not to loosen the staples.

The value of each question is indicated beside the statement of the question. The total value of all questions is 102 points.

Answer all questions on the exam paper in the space provided beneath the question. If you need more room, you may continue your work on the reverse side of the page, but CLEARLY INDICATE that your work is continued.

Question	Points	Score
1	44	
2	12	
3	12	
4	12	
5	10	
6	12	
7	0	
Total:	102	

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Multiple Choice Questions

1. [44 points] Answer the following multiple choice questions by circling the letter of the answer which is *most* correct.

   For questions 1 through 7, assume the following:

   $$P = (-1, -7) \quad Q = (0, 2)$$

   $$R = (3, 6) \quad S = (1, 3)$$

   (1) Q is the Y-intercept of which of these lines:

   (a) $y = 5x - 2$
   (b) $x = 2y + 0$
   (c) $y = 2x + 0$
   (d) $y = 2$
   (e) $x = 2$
   (f) None of the above

   (2) Q is the X-intercept of which of these lines:

   (a) $y = 5x - 2$
   (b) $x = 2y + 0$
   (c) $y = 2x + 0$
   (d) $y = 2$
   (e) $x = 2$
   (f) None of the above

   (3) R is on which of the following lines:

   (a) $y = 5x - 2$
   (b) $x = 2y + 0$
   (c) $y = 2x + 0$
   (d) $y = 2$
   (e) $x = 2$
   (f) None of the above

   (4) Which of the following is an equation for the line through P and S?

   (a) $y = 5x - 2$
   (b) $x = 2y + 0$
   (c) $y = 2x + 0$
   (d) $y = 2$
   (e) $x = 2$
   (f) None of the above

   (5) What is the slope of the line through R and S?

   (a) 1
   (b) -1
   (c) 3
   (d) -3
   (e) 6
   (f) None of the above

   (6) Which points satisfy the inequality $3x < 7y - 2$?

   (a) Q, S
   (b) Q
   (c) P, Q, R, S
   (d) Q, R, S
   (e) P, R, S
   (f) None of the above

   (7) Which of the following is the intersection of $y = 2x + 2$ and $3x - 5y = -10$?

   (a) P
   (b) Q
   (c) R
   (d) S
   (e) $(2, 2)$
   (f) None of the above

(8) Which of the following equations is in point-slope form, and is equivalent to the equation $3x + 2y = 7$?

(a) $y = \frac{-3}{2}x + \frac{7}{2}$
(b) $y - 2 = \frac{-3}{2}(x - 1)$
(c) $y = -3x + 7$
(d) $y - 1 = \frac{-3}{2}(x - 2)$
(e) $x = -2y + 7$
(f) None of the above

For questions 9 through 13, assume the following:

$$A = \begin{bmatrix} 3 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & -1 & 1 \end{bmatrix} \quad B = \begin{bmatrix} -1 \\ 1 \\ 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 3 & 2 & 1 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 1 \\ 2 & 3 \\ -1 & 1 \end{bmatrix}$$

(9) What is the $(2, 2)$ position entry of AB?

(a) 0
(b) -2
(c) Does not exist
(d) None of the above

(10) Is $BC = CB$?

(a) Yes
(b) No

(11) What is the $(1, 1)$ entry of CA?

(a) 12
(b) 11
(c) Does not exist
(d) None of the above

(12) What is the $(3, 3)$ entry of BC?

(a) 1
(b) 2
(c) Does not exist
(d) None of the above

(13) What is the $(1, 2)$ entry of $D^T A$?

(a) 4
(b) 2
(c) Does not exist
(d) None of the above

(14) What is 13 in base 7?

(a) $(15)_7$
(b) $(16)_7$
(c) $(17)_7$
(d) $(14)_7$

(15) What is $(1A)_{16}$ in decimal?

(a) 25
(b) 17
(c) 26
(d) 31

(16) What is the GCD of 85 and 114?

(a) 1
(b) 17
(c) 85
(d) None of the above

(17) What is the smallest positive number in the residue class of 19 mod 8?

(a) 1
(b) 2
(c) 3
(d) 4

(18) Is there a graph with the degree sequence {1, 1, 3, 3, 3}?

(a) Yes
(b) No
(c) Not enough information to tell

(19) Is there a graph with the degree sequence {1, 2, 3, 4, 4}?

(a) Yes
(b) No

(20) Does a graph with degree sequence $\{1, 1, 1, 1, 4\}$ have an Euler Circuit?

(a) Yes
(b) No
(c) Not enough information to tell
(d) No such graph exists

(21) Does a graph with degree sequence $\{2, 2, 3, 4\}$ have an Euler Path?

(a) Yes
(b) No
(c) Not enough information to tell
(d) No such graph exists

(22) Does a graph with degree sequence $\{1, 1, 2, 4, 4\}$ have a Hamilton Circuit?

(a) Yes
(b) No
(c) Not enough information to tell
(d) No such graph exists

(23) **(BONUS: 2 MARKS)** How many different perfect matchings exist in a K_6?

(a) 0
(b) 1
(c) 12
(d) 15
(e) 31
(f) 33

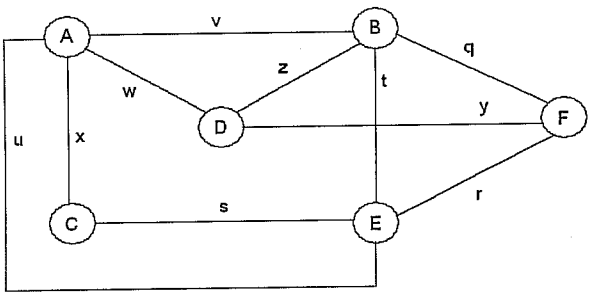
Long Answer

2. [12 points] Graph the following feasible set. Identify all vertices.

$$x + y < 3 \qquad x - y \geq 0$$

$$y \leq 2 \qquad x \geq 0 \qquad y \geq 0$$

3. [12 points] Consider the following graph:



(1) Find an adjacency matrix for this graph.

(2) Find an incidence matrix for this graph.

(3) What is the degree sequence for this graph?

(4) Find an example of each of the following in the above graph, or explain why they do not exist:

i. Euler Path

ii. Euler Circuit

iii. Hamilton Path

iv. Hamilton Circuit

4. [12 points] Solve the following system of equations using Gauss-Jordan Elimination (marks will be deducted for using any other method)

$$2x - 3y + z = 4$$

$$4x - 4y - z = 2$$

$$2x + z = 4$$

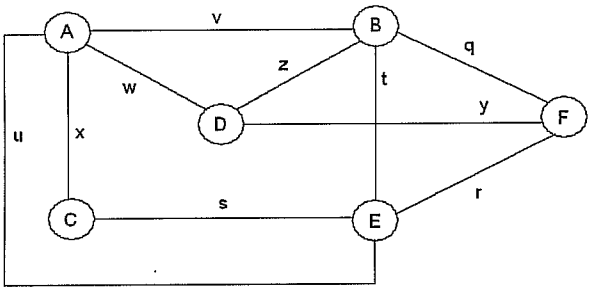
5. [10 points] Find the inverse of the matrix:

$$\begin{bmatrix} 2 & 1 \\ 3 & 7 \end{bmatrix}$$

6. [12 points] Use the Euclidean Algorithm method to find an integer solution to:

$$1155x + 221y = 1$$

7. [0 points] **(BONUS: 5 MARKS)** Find a valid 4 coloring of the following graph, or explain why one does not exist.



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