## Final Exam

- Friday, August 2
- 12:00 to 1:50 p.m.
- In Lawson 151
- Comprehensive (covers entire course).
- Makes up 25% of your grade.

## Formulas provided on exam:

$$A = P(1 + rt)$$

$$A = P(1+i)^{nt}$$

$$A = d \left[ \frac{(1+i)^{nt} - 1}{i} \right]$$

9. What is the distance between received words 1001010 and 1010110?

A) 1
B) 2
C) 3
D) 4

10. Find the sum [12] + [23] in  $Z_7$ :



11. Suppose that the generator matrix for a (4,8)-code is

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \end{bmatrix}$$

Find the codeword corresponding to 1101.

- A) 11011111
- B) 11010000
- C) 11010100
- D) 11010101

- 12. Suppose that the check matrix for a (2,6) matrix code is given at right. Decode the word 001001 if it is a codeword or if it differs from a codeword in a single digit. The decoded message is:
  - A) 00
  - **B**) 01
  - **(C)** 10
  - D) Cannot be decoded.



13. A group of 13 students have to decide among three types of pizza: Sausage (S), Mushroom (M), and Beef (B). Their preference rankings are shown below.Which choice will the group make if they use the Plurality method?

Number of Votes 3 4 2 2 2 First choice Μ S Μ S B Second choice Μ B S Μ В Third choice S S B B Μ

A) S B) B

(C)

D) No winner can be chosen

14. A group of 12 students have to decide among three types of pizza: Sausage (S), Mushroom (M), and Beef (B). Their preference rankings are shown below.Which choice will the group make if they use the Borda count?

3 Number of Votes 3 2 2 2 First choice S Μ S B Μ Second choice B S Μ Μ В Third choice S S B B Μ

A) S (B) M (C) B (D) No winner can be chosen B: 3(3) + 3(2) + 2(1) + 2(1) + 2(2) = 23M: 3(2) + 3(3) + 2(2) + 2(3) + 2(1) = 27S: 3(1) + 3(1) + 2(3) + 2(2) + 2(3) = 22 15. Suppose that a nine-member committee needs to elect one of the four alternatives. Their preference schedule is shown below. Which choice will the committee make if they use the plurality-with-elimination method?

Number of Votes		4	3	2
First choice		А	В	С
Second choice		В	D	D
Third choice		С	A	В
Fourth choice		D	С	Α
A	B) B	C) C	D	) D

A)

16. You have \$5000 that you invest at 6% simple interest. What is the balance after 12 years?

A) \$5,300 B) \$8,600 C) \$7,200 D) \$10,061

 $A = P(1 + rt) = 5000(1 + 0.06 \times 12)$ = 5000(1.72) = 8,600 17. Suppose you invest in an account that pays 6% interest, compounded quarterly. You would like your investment to grow to \$4000 in 11 years. How much would you have to invest in order for this to happen?

A) \$1966 B) \$2410 (C) \$2078 D) \$3475  

$$A = P(1 + i)^{nt}$$
  
 $i = 0.06/4 = 0.015$ ,  $nt = 4 \times 11 = 44$   
 $4000 = P(1 + 0.015)^{44}$   
 $4000 = P(1.925333)$   
 $P = 4000/1.925333$   
 $= 2078$ 

18. What is the effective annual rate (APY) for 5.1% compounded monthly?

How much interest on a \$1 investment after 1 year? P = 1, t = 1 i = 0.051/12 = 0.00425, n = 12  $(1 + i)^n - 1 = (1.00425)^{12} - 1$ = 0.0522