# 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 $Z_7$:

    A)  [8]
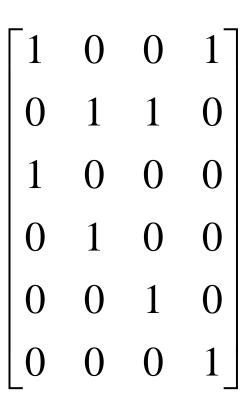    B)  [1]
    C)  [0]
    D)  [5]

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:

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

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 | 4 | 3 | 2 | 2 | 2 |
|---|---|---|---|---|---|
| First choice | B | M | S | M | S |
| Second choice | M | B | M | S | B |
| Third choice | S | S | B | B | M |

A) S     B) B     C) M     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?

| Number of Votes | 3 | 3 | 2 | 2 | 2 |
|---|---|---|---|---|---|
| First choice | B | M | S | M | S |
| Second choice | M | B | M | S | B |
| Third choice | S | S | B | B | M |

A) S     B) M     C) B     D) No winner can be chosen

# 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 | A | B | C |
| Second choice | B | D | D |
| Third choice | C | A | B |
| Fourth choice | D | C | A |

A) A          B) B          C) C          D) D

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

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

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

A) 5.0%    B) 5.1%    C) 5.2%    D) 5.3%

19. At the end of each month, Juanita deposits $50 into a savings account earning 4.5% interest compounded monthly. How much is the account worth at the end of five years?

A) $3357   B) $3135   C) $ 3755   D) $3522

20. May takes out a conventional loan to purchase a car. The interest rate is 6.8% compounded monthly and May has six years to repay the $15,000 she borrowed. What are May's monthly payments?

A) $143.19   B) $209.00   C) $254.30   D) $435.22