Bishop's University

Math 196: Final Exam
Fall 2021

Name: _____

Student #: _____

- Prepare neat solutions. Briefly justify your work, that is, *make your reasoning clear.*
- All answers must be exact (no decimals allowed) unless specifically directed otherwise.
- The back of each page may be used for scrap paper.
- A **Casio fx260-solar** or **Casio fx260-solar II** calculator is permitted. No other aids are permitted.
- **Remember that Bishop's University has a ZERO-TOLERANCE POLICY for academic misconduct on final exams.**

Page	Points	Score
2	15	
3	15	
4	15	
5	15	
6	15	
7	25	
Total:	100	

1. Evaluate, if possible,

   (a) (5 points) $\sum_{i=12}^{49} 3i$

   (b) (5 points) $\sum_{k=1}^{40} k^3 + k^2 + k + 1$

   (c) (5 points) $\sum_{n=1}^{\infty} 10 \left(\frac{7}{5}\right)^{1-n}$

2. You have received a 7-year loan for \$35,000. The interest rate is 0.3% per month, with interest computed at the end of each month.

   (a) (5 points) If you put the amount of the loan into an account, Account A which pays the same interest rate, how much money is in the account at the end of 7 years?

   (b) (5 points) In a separate account, Account B, you make regular monthly deposits at the end of each month for the same 7 years. What is the value of the regular payments so that the amount of money in Account A and Account B are the same after the 7 years?

   (c) (5 points) After 5 years, how much more money is in Account A as compared to Account B?

3. Consider the following matrices:

$$A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & -2 & 0 \\ -1 & -1 & 1 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 0 \\ 1 & 3 \\ 1 & -3 \end{bmatrix}, \quad D = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

Evaluate, if possible, If not possible, give reason(s).

(a) (5 points) $3A + 2C^T B^T$

(b) (5 points) $A^2 - 5A + I$

(c) (5 points) $3DB + 10I$

4. (5 points) Find values x such that

$$\begin{bmatrix} 3 & x \end{bmatrix} \begin{bmatrix} 2 & -1 \\ -1 & 3 \end{bmatrix} \begin{bmatrix} x \\ -5 \end{bmatrix} = 5$$

5. (10 points) A person is ordered by doctor to take 15 units of vitamin A, 12 units of vitamin D, and 8 units of vitamin E each day. There are three brands of vitamin supplement available: brand X contains 2, 1, and 2 units, brand Y contains 3, 2, and 2 units and brand Z contains 4, 4, and 1 units of vitamin A, D, and E, respectively. How many pills of each brand will provide the required amounts of vitamin?

6. (5 points) A standard deck of cards consists of four suits (clubs, diamonds, hearts, and spades), with each suit containing 13 cards (ace, two through ten, jack, queen, and king) for a total of 52 cards in all.

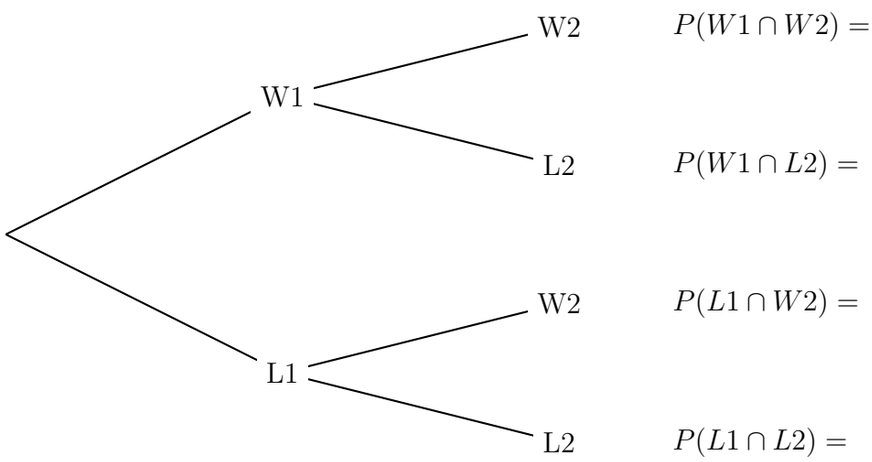
   How many 8-card hands will consist of exactly 2 hearts and 2 clubs?

7. (5 points) A bag contains 6 red marbles, 7 white marbles, and 10 blue marbles. You draw 3 marbles out at random, without replacement. What is the probability that all the marbles are red?

8. (5 points) A fair coin is tossed seven times in a row. Find the probability of getting exactly three heads if the third toss is a tail.

9. At the beginning of a tournament, a certain curling team has a 53% probability of losing the first game. If the team win the first game, they have an 85% probability of winning the next game. If the team does not win the first game, they have a 35% probability of losing the next game. No ties are possible. **For this question, the answers are to be decimal numbers with four decimal places.**

   (a) (10 points) Find the indicated probabilities. You may use the probability tree given below if it is helpful.



   (b) (5 points) Find the probability that the team will lose exactly one game.

   (c) (5 points) If the team won the second game, find the probability that they won the first game.

   (d) (5 points) If the team lost the second game, find the probability that they lost the first game.