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Circle the letter corresponding to your answer. Circle only one answer per question. There is no partial credit on this portion of the exam. Answer the long answer questions on the exam itself.

1. T      F
2. T      F
3. T      F
4. T      F
5. T      F
6. T      F
7. T      F
8. A      B      C      D      E
9. A      B      C      D
10. A      B      C      D      E
11. A      B      C      D
12. A      B      C      D      E      F
13. A      B      C      D      E      F
14. A      B      C      D      E
15. A      B      C      D      E      F
16. A      B      C      D
17. A      B      C      D      E

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True / False Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle T if the statement is always true and circle F if the statement is sometimes false.

1. T      F      If  $8 = 5$ , then  $2 + 2 = 4$ .
  
2. T      F      If a statement is always false it is a tautology.
  
3. T      F       $0! = 1$
  
4. T      F       $P(6, 3)$  is smaller than  $C(6, 3)$ .
  
5. T      F      The set  $\{a, b, c, d, e, f\}$  has  $C(6, 3)$  subsets with 3 elements.
  
6. T      F       $P(6, 2) = \frac{6!}{4!}$
  
7. T      F      Combinations are used when order does not matter.

Multiple Choice Record all answers on the cover page / answer sheet. There is no partial credit for this portion of the exam. Circle the letter corresponding to the best answer.

8. To show that  $p$  implies  $q$ , you
- A. show that  $p \rightarrow q$  is a tautology.
  - B. show that  $p \rightarrow q$  is a contradiction.
  - C. show that the column under  $p$  matches the column under  $q$ .
  - D. show that the column under  $p$  doesn't match the column under  $q$
  - E. None of the above.

9. Given the following premises;

Unless it rains, the grass will not grown.  
If the grass grows, I will cut it.  
It rains.

Which of the following is a valid conclusion?

- A. The grass grows.
  - B. I will cut the grass.
  - C. If the grass does not grow, I will not cut it.
  - D. None of the above.
10. Assume the original statement "If it is a poodle, then I will buy it" is true. Which of the following must also be true?
- A. If I don't buy it, then it is a poodle.
  - B. If it is not a poodle, then I do not buy it.
  - C. If I buy it, then it is a poodle.
  - D. If I don't buy it, then it is not a poodle.
  - E. None of the Above.

11. Consider the following argument:

If Bill studies economics, he will make good money.  
If he studies business procedures, he will make good money.  
Bill studies economics, but not business procedures.

Which of the following is a logical conclusion?

- A. Bill does not get a college degree.
- B. Bill does not make good money.
- C. Bill makes good money.
- D. None of the above.

12. The serial number on a twenty dollar bill consists of two letters followed by eight digits and then a letter. How many different serial numbers are possible given that the first and last letters are repeatable vowels, the second letter is a consonant, and the digits can be repeated?

- A.  $5^2 \cdot 26 \cdot 10^8$
- B.  $C(26, 3) \cdot C(10, 8)$
- C.  $P(26, 3) \cdot P(10, 8)$
- D.  $5^2 \cdot 10^8 \cdot 21$
- E.  $26^3 \cdot 10^8$
- F. none of the above

13. A football league has nine teams. How many different end-of-the-season rankings of first, second and third are possible assuming that there are no ties?

- A. 504      B. 336      C. 27      D. 12      E.  $9! \cdot 3!$       F. none of the above

14. The Good Taste Restaurant has 7 entrees, 6 vegetables, and 9 desserts on its menu. If you want to order 1 entree, 1 vegetable, and 1 dessert, how many choices do you have?
- A.  $7 \cdot 6 \cdot 9$       B.  $P(22, 3)$       C.  $C(22, 3)$       D.  $C(13, 2) \cdot 9$       E. none of the above

15. A committee of 5 is to be selected from a group of 5 men and 6 women in such a way that there are at least 2 men and 2 women. Determine the number of ways this selection is possible.
- A. 360      B. 350      C. 340      D. 330      E. 320      F. none of the above

16. Draw two cards from a standard deck of 52 in order and without replacement. In how many ways can you draw one red card and one black card?
- A.  $2 \cdot 26 \cdot 26$   
B.  $26 \cdot 26$   
C.  $26 \cdot 25$   
D. None of the above.

17. How many "words" can be made from the letters in ALABAMA, if all of the letters must be used?

A.  $C(7, 7)$

B.  $P(7, 7)$

C.  $\frac{C(7,7)}{4!}$

D.  $\frac{7!}{4!}$

E. none of the above

**Long Answer.** Answer the following questions. **No work = no credit.**

18. Analyze the validity of the following argument using a truth table:

We will pay for collision loss only if collision coverage is afforded.

Collision coverage is not afforded.

Hence, we will not pay for collision loss.

19. Determine the exact value of  $\frac{9000!}{8998!}$

20. If a family has 7 children, in how many ways can the family have at most 2 girls? Give a number as your answer, but remember to show all work.