

Exam Instructions (no questions on this page): Please read carefully

- Answering a question is done by **circling ONLY** the correct choice on the **Answer Form**; no answering sheets will be distributed.
- Please choose only one answer; a question with more than one marked answer will be considered unsolved and will get zero marks.
- A question with ambiguous marking that can be interpreted as one of two (or more) answers will be considered unsolved and will receive zero marks.
- Any comment or writing will not be read by the grader. Therefore, you should not waste your time in any writing; just think then mark.
- Each correct answer receives one; and every four wrong answers receive minus one. For example, if you solve only 20 questions, 11 of them are correct and 9 are not, then 8 of the 9 will be counted as -2. Hence, you will get $11 - 2 = 9$. This is to impede those who seek credit by haphazard guessing. Therefore, if you do not know the answer it is better not to guess. It is improbable that mere guessing will improve your score significantly; it may even lower your score. If, however, you are not certain of the correct answer but have some knowledge of the question and are able to eliminate one or more of the answer choices, your chance of getting the right answer is improved, and it may be to your advantage to answer such a question.
- Each figure has a figure number. Sometimes the figure may have a caption; a caption is one or more statement at the bottom of the figure to explain that figure.
- All of the MCQ questions have the same weight.
- No one is allowed to borrow any thing from any colleague.

Exam Starts Next Page

The Following Problems Are Related

1. For the matrix

$$A = \begin{pmatrix} 1 & 2 & 2 \\ -1 & 2 & 4 \\ 5 & 1 & -1 \end{pmatrix},$$

the sum $s = \sum_{i \neq j} \sum a_{ij}$ equals to

- a) $\sum_{i,j} \sum a_{ij} - \text{trace}(A)$.
 - b) 13.
 - c) $\sum_{i>j} \sum a_{ij} + \sum_{i<j} \sum a_{ij}$.
 - d) all of the above.
 - e) none of the above.
2. Suppose that the matrix A is partitioned so that the block A_{11} is a 2×2 matrix. Then the block A_{22}
- a) $= -1$.
 - b) $= (2 \ 4)$.
 - c) $= (2 \ 4)'$.
 - d) $= (2)$.
 - e) none of the above; it does not exist.
3. Consider $y = Ax$, where $x = (1 \ 1 \ 1)'$. Then y is
- a) a three dimensional vector.
 - b) in the direction $(1 \ 1 \ 1)'$.
 - c) a linear combination of the columns of A .
 - d) all of the above.
 - e) none of the above.