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| Image result for adamas university logo | **ADAMAS UNIVERSITY**  **END SEMESTER EXAMINATION**  (Academic Session: 2020 – 21) | | |
| **Name of the Program:** | B.Sc in Computer Science | **Semester:** | I |
| **Paper Title:** | Linear Algebra | **Paper Code:** | SMA31145 |
| **Maximum Marks:** | 50 | **Time Duration:** | 3 Hrs |
| **Total No. of Questions:** | **17** | **Total No of Pages:** | 02 |
| *(Any other information for the student may be mentioned here)* | 1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. 2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. 3. Assumptions made if any, should be stated clearly at the beginning of your answer. | | |

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| **Group A**  **Answer All the Questions (5 x 1 = 5)** | | | |
| 1 | What is the index of a square matrix? | **R** | **CO1** |
| 2 | Define row space of a matrix. | **R** | **CO3** |
| 3 | Define geometric multiplicity of an eigen value. | **R** | **CO4** |
| 4 | Define the basis of a vector space. | **R** | **CO5** |
| 5 | Define range of a linear transformation. | **R** | **CO6** |
| **Group B**  **Answer All the Questions (5 x 2 = 10)** | | | |
| 6 a) | Find the value of, such that is orthogonal. | **R** | **CO1** |
| **(OR)** | | | |
| 6 b) | Let A and B be matrices such that the product AB is defined. Show that if A has two identical rows, then the corresponding two rows of AB are also identical. | **R** | **CO1** |
| 7 a) | Ifbe a non-singular matrix prove that the row vectors ofare linearly independent. | **R** | **CO3** |
| **(OR)** | | | |
| 7 b) | Find the basis for column space of the matrix. | **R** | **CO3** |
| 8 a) | Findfor the linear transformation | **R** | **CO6** |
| **(OR)** | | | |
| 8 b) | Find whether the following mapping is a linear transformation or not: given by | **R** | **CO6** |
| 9 a) | Show that eigenvalues of a skew Hermitian matrix are purely imaginary or zero. | **U** | **CO4** |
| **(OR)** | | | |
| 9 b) | Find the characteristic equation of | **U** | **CO4** |
| 10 a) | **Show** that the intersection of any two subspaces of a vector space is a subspace. | **R** | **CO5** |
| **(OR)** | | | |
| 10 b) | **Show** that if is a basis of a vector space, then the setis also a basis for. | **R** | **CO5** |
| **Group C**  **Answer All the Questions (7 x 5 = 35)** | | | |
| 11 a) | Find the inverse of the matrixusing elementary row operations. | **R** | **CO1** |
| **(OR)** | | | |
| 11 b) | i) Ifbe an idempotent matrix of ordershow that the matrix is also idempotent.  ii) Express as sum of a symmetric and a skew-symmetric matrix. | **R** | **CO1** |
| 12 a) | Solve the following system of equations, if possible: | **R** | **CO2** |
| **(OR)** | | | |
| 12 b) | If the system of equation  has nontrivial solution then prove that . | **R** | **CO2** |
| 13 a) | Letandbe two matrices over the same fieldsuch thatis defined. Then prove that | **R** | **CO3** |
| **(OR)** | | | |
| 13 b) | Find the row rank and the column rank of the matrix | **R** | **CO3** |
| 14 a) | Find a non-singular matrixsuch thatis a diagonal matrix, where and the eigen values are. | **U** | **CO4** |
| **(OR)** | | | |
| 14 b) | Find the eigen values and corresponding eigen vectors of the following real matrix. | **U** | **CO4** |
| 15 a) | Find whether is a basis for | **R** | **CO5** |
| **(OR)** | | | |
| 15 b) | Find whetheris a subspace of If so, then what is the dimension of the subspace? | **R** | **CO5** |
| 16 a) | Find the linear transformation using the following information: | **R** | **CO6** |
| **(OR)** | | | |
| 16 b) | Find the matrix representation of the linear transformation given by,  with respect to the bases. | **R** | **CO6** |
| 17 a) | If then show that, | **U** | **CO4** |
| **(OR)** | | | |
| 17 b) | Determine by using Cayley-Hamilton theorem for the matrix | **U** | **CO4** |