

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: M.TECH.  
BRANCH: CS/IT/IS**

**SEMESTER : I  
SESSION : MO/19**

**SUBJECT: CS501 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE**

**TIME: 3:00 HOURS**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) List out the steps involved in Gauss- Jordan Elimination method of Solving systems of n equations of n variables. Using same method, solve the following system of equation: [5]  
 $x_1 + 2x_2 - x_3 + 3x_4 + x_5 = 2$   
 $2x_1 + 4x_2 - 2x_3 + 6x_4 + 3x_5 = 6$   
 $-x_1 - 2x_2 + x_3 - x_4 + 3x_5 = 4$
- Q.1(b) When set of vectors called linearly dependent or independent. [5]  
Prove that a set of vectors in any vector space is linearly dependent if that contains the zero vector.
- Q.2(a) What do you mean by Non-Euclidean Geometry? How is it different from Euclidean Geometry? Explain with suitable example. [5]
- Q.2(b) The Star Sirius is 8 light years from earth. If a spaceship that leaves for Sirius returns to Earth 20 years later, then [5]  
What is the duration of voyage for a person on spaceship?  
What is the speed of spaceship?
- Q.3(a) Explain the Empirical Rule for interpretation of Standard Deviation for data set with symmetric and mound shaped frequency distribution. [5]
- Q.3(b) A Solar panel manufacturer claims the average life of a panel is 30 years, however the guarantee given is only 20 years. If the standard deviation is 5 years and the frequency distribution is mound- shaped, then: [5]  
What percentage of Panel will last more than 25 years?  
What percentage of Panel will last less than 20 years?  
If a Panel lasts for 18 years, then what will be inferred about manufactures claim?
- Q.4(a) Define Probability Distribution of a Discrete Random Variable. [5]  
Two fair coins are tossed, and their up faces are recorded. Let x be the number of heads observed. Find the probability associated with each value of random variable x.
- Q.4(b) What do you mean by expected value of a discrete random variable? [5]  
An insurance company offers a whole life insurance policy of \$ 20000 at an annual premium \$600. The Actuarial tables show that the probability of death of a person during the next year is 0.001. What is the expected gain for the policy of this type?
- Q.5(a) With suitable example, explain the method of finding adjacency matrix of a simple graph. [5]
- Q.5(b) What do you mean by Incidence matrix of a graph? Describe with suitable example. [5]  
Prove that two graphs are isomorphic if and only if their incidence matrices differ only by permutations of rows and columns.

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