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

CLASS: MTECH **SEMESTER : I**
BRANCH: IS/CS/IT **SESSION : MO/18**

SUBJECT: CS501 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

TIME: 3.00 HRS **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.

Q.1(a) Determine necessary and sufficient condition for a triangular matrix to be invertible. Let A = [-2]. Then find det(A). Explain the main idea of Jacobi approach for solving a set of linear equations. [5]

Q.1(b) Apply Jacobi approach to solve [5]

$5x_1 - 2x_2 + 3x_3 = -1$
$-3x_1 + 9x_2 + x_3 = 2$
$2x_1 - x_2 - 7x_3 = 3$

Continue iterations until two successive approximations are identical when rounded to three significant digits.

Q.2(a) There are *m* different types of food: $F_1,...,F_m$, that supply varying quantities of the *n* nutrients, $N_1,...,N_n$, that are essential to good health. Let c_j be the minimum daily requirement of nutrient, N_j. Let b_i be the price per unit of food, F_i. Let a_{ij} be the amount of nutrient N_j contained in one unit of food F_i. The problem is to supply the required nutrients at minimum cost. Formulate the problem in LPP. [5]

Q.2(b) Solve this LPP using any suitable approach. [5]

Minimize: $4a + 5b + 6c$

subject to

$a + b \geq 11$

$a - b \leq 5$

$c - a - b = 0$

$7a \geq 35 - 12b$

$a \geq 0, b \geq 0, c \geq 0$

Q.3(a) What is basis of a vector space? Let us consider V_4 over F(2). Find the number of vectors in V_4. Let S be a sub-space of V_4 as: (1 1 0 0), (1 0 1 1), (0 1 1 1) and S_d be another sub-space as: (1 1 0 1), (1 1 1 0), (0 0 1 1). Are the dual space to each other? Justify your answer. [5]

Q.3(b) An urn contains 10 black and 10 white balls. Draw three (*a*) without replacement, and (*b*) with replacement. What is the probability that all three are white? [5]

Q.4(a) Toss a coin 10 times. If you know (a) that exactly 7 Heads are tossed, (b) that at least 7 Heads are tossed, what is the probability that your first toss is Heads? [5]

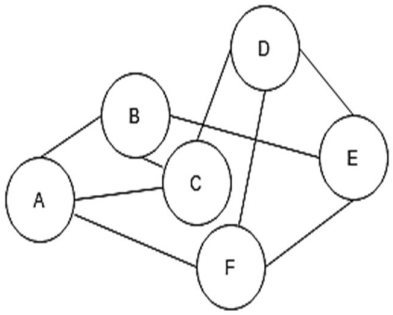
Q.4(b) (i) The average number of accidents at a level-crossing every year is 5. Calculate the probability that there are exactly 3 accidents there this year. [5]

ii) A random sample of 10 boys had the following IQ's 70,120,110,101,88,83,95,98,107,100. Do these data support the assumption of a population mean IQ of 100? Find the reasonable range in which most of the mean IQ values of samples of 10 boys lie? [Tabulated Value = 2.26 (at 5% level of significance with 9 degrees of freedom)].

PTO

Q.5(a) Give some applications of planar graph. Discuss the limitations of Adjacency matrix representation and adjacency list representation of graph. [5]

Q.5(b) Does the graph shown below is regular? Find the *cut-vertices* and the *cut-edges* of the following graph (if exist). Define *clique*. Also, give some applications of clique. [5]



:::::28/11/2018:::::M