Module Code:	**MA4001NT**
Module Title:	**Logic and Problem Solving**
Module Leader:	**Mr. Santosh Parajuli / Mr. Ashok Dhungana (Islington College)**

Coursework Type:	Group Coursework
Coursework Weight:	This coursework accounts for **50%** of the overall module grades.
Submission Date:	**Tuesday, 20 May 2025**
Coursework given out:	**Week 25**
Submission Instructions:	Submit the following to the Itahari International College's MST portal before 01:00 PM on the due date: ● A report (document) in .pdf format must be submitted in the MST platform or through any medium which the Module Teacher specifies.
Warning:	London Metropolitan University and Itahari International College takes plagiarism very seriously. Offenders will be dealt with sternly.

© London Metropolitan University

Plagiarism:

You are reminded that there exist regulations concerning plagiarism. Extracts from these regulations are printed overleaf. Please sign below to say that you have read and understand these extracts:

Extracts from University *Regulations on Cheating, Plagiarism and Collusion*

Section 2.3: *"The following broad types of offence can be identified and are provided as indicative examples …*

(i) *Cheating: including taking unauthorised material into an examination; consulting unauthorised material outside the examination hall during the examination; obtaining an unseen examination paper in advance of the examination; copying from another examinee; using an unauthorised calculator during the examination or storing unauthorised material in the memory of a programmable calculator which is taken into the examination; copying coursework.*

(ii) *Falsifying data in experimental results.*

(iii) *Personation, where a substitute takes an examination or test on behalf of the candidate. Both candidate and substitute may be guilty of an offence under these Regulations.*

(iv) *Bribery or attempted bribery of a person thought to have some influence on the candidate's assessment.*

(v) *Collusion to present joint work as the work solely of one individual.*

(vi) *Plagiarism, where the work or ideas of another are presented as the candidate's own.*

(vii) *Other conduct calculated to secure an advantage on assessment.*

(viii) *Assisting in any of the above.*

Some notes on what this means for students:

1. Copying another student's work is an offence, whether from a copy on paper or from a computer file, and in whatever form the intellectual property being copied takes, including text, mathematical notation, and computer programs.

2. Taking extracts from published sources *without attribution* is an offence. To quote ideas, sometimes using extracts, is generally to be encouraged. Quoting ideas is achieved by stating an author's argument and attributing it, perhaps by quoting, immediately in the text, his or her name and year of publication, e.g. "e = mc^2 (Einstein 1905)". A *reference* section at the end of your work should then list all such references in alphabetical order of authors' surnames. (There are variations on this referencing system which your tutors may prefer you to use.) If you wish to quote a paragraph or so from published work then indent the quotation on both left and right margins, using an italic font where practicable, and introduce the quotation with an attribution.

School of Computing, FLSC

<u>CONTRACT CHEATING</u>

Contract cheating (also known as assessment outsourcing, commissioning or ghost writing) is when someone seeks out another party, or AI generator service, to produce work or buy an essay or assignment, either already written or specifically written for them or the assignment to submit as their own piece of work.

Contract cheating undermines the integrity of the academic process and devalues the qualifications awarded by the university. Students are reminded that academic integrity is a fundamental principle of our institution. Engaging in contract cheating not only impacts the individual's academic record but also the reputation of the university.

Students are encouraged to seek support if they are struggling with their coursework. The university offers a range of resources, including academic counselling, tutoring services, and workshops on study skills and time management. Utilizing these resources can help students achieve their academic goals without resorting to dishonest practices.

Penalty:

- Failure in the Module: The student must re-register for the same module, and the re-registered module will be capped at a bare pass.

- Ineligibility to Continue on the Course: Where re-registration of the same module, or a suitable alternative, is not permissible, the student will not be able to continue on the course. Additionally, the following penalty will be applied to the student's final award:

  - Undergraduate Honors: The student's final classification will be reduced by one level.
  - Unclassified Bachelors: Downgraded to Diploma in Higher Education.
  - Foundation Degree: Distinction downgraded to Merit; Merit downgraded to Pass; Pass downgraded to Certificate in Higher Education.
  - Masters: Distinction downgraded to Merit; Merit downgraded to Pass; Pass downgraded to Postgraduate Diploma.

Reporting and Consequences:

Instances of contract cheating will be thoroughly investigated, and students found guilty will face the penalties outlined above. It is the responsibility of every student to ensure that their work is their own and to avoid situations that could lead to accusations of academic misconduct.

By adhering to these standards, students contribute to a fair and equitable academic environment, ensuring the value and recognition of their qualifications are maintained.

MA4001NT: Logic and Problem Solving

Problem 1 [20 Marks]

Write a procedure, tax, to calculate (*in Nepalese Rupees*) the tax a person owes, depending on his/her income. Calculate the tax using this table:

Taxable income (Rs)	Income tax rates (Percent)
0 to 50,000	1%
50,000 to 2,00,000	10%
2,00,000 to 3,00,000	20%
3,00,000 to 10,00,000	30%
10,00,000 to 30,00,000	36%
30,00,000 and above	39%

The procedure should show.
   i)   The salary,
   ii) The tax rate,
   iii) The amount of tax
   iv) The amount left after tax and
   v)   Be able to deal with any input, valid or not.

Your tests of procedure should include the following values, which should be included in your final presentation.

   a) tax (Rs. 4,05,000)

       Deductions:
       -   Employees provident fund organization: (Rs. 10,000)
       -   Life Insurance premium: (Rs. 68,000)
       -   Citizen Investment Trust:(Rs. 0)

   b) tax (Rs. 8,09,090)

       Deductions:
       -   Employees provident fund organization: (Rs. 15,000)
       -   Life Insurance premium: (Rs. 20,000)
       -   Citizen Investment Trust:(Rs.5,000)

c) tax (Rs. 19,10,000)

Deductions:
- Employees provident fund organization: (Rs. 0)
- Life Insurance premium: (Rs. 2,50,000)
- Citizen Investment Trust:(Rs.50,000)

d) tax (Rs. 2,108,790)

Deductions:
- Employees provident fund organization: (Rs. 1,50,000)
- Life Insurance premium: (Rs. 30,000)
- Citizen Investment Trust:(Rs.25,000)

e) tax (Rs. 31,800)

Deductions:
- Employees provident fund organization: (Rs.0)
- Life Insurance premium: (Rs. 5,000)
- Citizen Investment Trust:(Rs. 0)

f) tax (Rs. - 50,000)

Deductions:
- Employees provident fund organization: (Rs.0)
- Life Insurance premium: (Rs. 0)
- Citizen Investment Trust:(Rs. 0)

Problem 2 [50 Marks]

Part A [35 Marks]

Berkshire Health Care patient diet is to contain at least 8 units of vitamins, 9 units of minerals, and 10 carbohydrates. Three foods, Food A, Food B, and Food C are to be purchased. Each unit of Food A provides 1 unit of vitamins, 1 unit of minerals, and 2 carbohydrates. Each unit of Food B provides 2 units of vitamins, 1 unit of minerals, and 1 carbohydrate. Each unit of Food C provides 2 units of vitamins, 1 unit of minerals, and 2 carbohydrates. If Food A costs $3 per unit, Food B costs $2 per unit and Food C costs $3 per unit, how many units of each food should be purchased to keep costs at a minimum.

Questions
You should answer the following questions and incorporate your answers into a word-processed report to form part of your final pdf. The sections of your report should correspond to the individual questions following.

   a) Formulate the problem as a linear programming model, clearly defining the variables, the objective function, and the constraints.
   b) Solve the problem using Simplex method.
   c) Solve the problem using the Excel Solver and interpret the results.
   d) For the final part of your report, in your capacity as an Adviser, you should present a memorandum to the **Berkshire Health Care**. Describe your main conclusions in simple, non-technical English, i.e., do not use technical terms like variable, objective function, or dual price. Don't worry about repeating some or all the points that you have already made in answer to earlier questions. The aim is to communicate your conclusions clearly to someone who is knowledgeable about the combination of food used in the diet plan, but who knows nothing about the subject of linear programming. You may use tables and charts if you wish.

Part B [15 Marks]

Mr. Harris requires minimum 10,12 and 12 units of chemicals A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively per jar. A dry product contains 1, 2 and 4 units of A, B and C per carton. If the liquid product cost £ 3 per jar and dry product cost £ 2 per cartoon, how many of each should Harris purchase in order to minimize the cost and meet the requirements. **Formulate this problem and solve it graphically**.

Problem 3 [20 Marks]

If the revenue function for a manufacturing company is R(x) = 10 – x and the total cost function is C(x) = x^2 - 8x + 20, where x is output.

You should answer the following questions and incorporate your answers into a word-processed report. The sections of your report should correspond to the individual questions below.

Questions

a) Find the breakeven points (round in 3 decimal places).
   Briefly explain the breakeven points in terms of number of items and cost.

b) Plot the revenue and cost functions on graph, showing the accurate break-even output levels and corresponding price.

c) Determine the profit function $P(x)$, for the company and find,

   (i) The level production that maximizes the profit.
   (ii) The maximum profit.

Viva & Presentation [10 marks]

(Automatically will fail the CW if viva is not attended)

Presentation of the documentation

Note: This work is to be completed by the group. All stages of the work: the problem formulation, Excel spreadsheet work, interpretation and documentation should be shared. The documentation must include a log of meetings, and this should indicate that all students have taken part at each stage. If the group does not agree that a particular member(s) of the group should have the same mark as the rest of the group, all group members need to complete the confidential peer assessment form and email this form to Santosh Parajuli (santosh.parajuli@iic.edu.np).

Files must be uploaded to MST(MySecondTeacher) platform by the deadline:
A <u>single</u> .pdf of all three questions with their answers, the group's log, and a cover sheet which must show the group's name, the students' names and their ID saved with the appropriate file name. All questions and their answers must be distinguishable.

-END-

Marking Scheme for Group Coursework:

Student Id:	
Student Name:	
Marks: /100	

Marks Title	Marks
Problem 1 For each procedure - 1 mark each total 5 marks For screen shot of template and formula 3 marks For each tax calculation - 2 marks each total 12 marks	**/20**
Problem 2 – Part A	
Question No.(a) Decision variables – 1 mark Objective function – 2 marks Constraints – 3 marks	**/6**
Question No.(b) Up to correct standard equation for simplex table- 4 marks For correct simplex table – 10 marks For correct answer and conclusion – 2 marks	**/16**
Question No.(c) For correct procedure and screen shots – 5 marks Explanation and conclusions – 2 marks	**/7**
Question No.(d) For best memorandum with no technical terms – 6 marks	**/6**
Problem 2 – Part B	
For correct decision variables, objective function, and Constraints – 4 marks For correct solution up to origin tests – 6 marks For correct Graph – 3 marks For correct answer table and conclusion – 2 marks	**/15**
Problem 3	
Question No (a) For equating cost and revenue function – 2 marks For correct equation – 2 marks	**/10**

For comparing and correct formula – 2 marks For correct solution of breakeven points – 4 marks	
Question No (b) For correct graph and conclusion – 5 marks	**/5**
Question No (c) For correct profit function – 1 mark For correct level of production – 2 marks For correct maximum profit – 2 marks	**/5**
Viva & Presentation **(Automatically will fail the CW if viva is not attended)**	**/10**