Tribhuvan University
Institute of Science and Technology
SCHOOL OF MATHEMATICAL SCIENCES
First Assessment 2080

Subject: **Deep Learning** *Full Marks*: 45
Course No: **MDS 655** *Pass Marks*: 22.5
Level: **MDS /II Year /IV Semester** *Time*: 2 hrs

Candidates are required to give their answers in their own words as far as practicable.

Attempt All Questions.

Group A [3 ×5 = 15]

1. Differentiate between machine learning and deep learning.
2. Discuss mechanics of machine learning.
3. Discuss McCulloch Pits model of neuron.
4. Explain the concept of Underfitting and overfitting.
5. What is delta rule? Discuss briefly.

Group B [5 × 6 = 30]

6. Derive weight update rule for backpropagation algorithm using binary cross entropy as loss function.

OR

Discuss gradient descent variations along with their pros and cons.

7. Why deep learning models are prone to overfitting? Discuss the roles of validation sets in building deep learning models.
8. Why regularization is used in deep learning? Discuss various regularization methods.
9. Consider an ANN having single neuron with two inputs and logistic activation function. Assume that learning rate is 0.1 and momentum hyperparameter is 0.9. Show weight updates for the training tuples {(0.7,0.5, 0.8), (1,0.4, 0.9)} using momentum. Assume that initial weights are (0.2,0.2).

OR

Consider a neural network having single neuron with two inputs and logistic activation function. Assume that learning rate is 0.2 and momentum hyperparameter is 0.9. Show weight updates for the training tuples {(0.9,0.3, 0.6), (0.3,1, 0.9)} using Adagrad. Assume that initial weights are (0.5,0.5).

10. Why the concept of learning rate annealing is important? Discuss the concept of second order methods used in training neural networks.

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First Assessment 2080

Full Marks: **45**
Pass Marks: **22.5**
Time: **2hrs**

Subject: **Data Visualization**
Course No.: **MDS 651**
Level: **MDS/II Year/IV Semester**

Candidates are required to give their answer in their own words as far as practicable.

Attempt ALL questions.

Group A [5 × 3 = 15]

1. Explain the concept of visual perception and its significance in data visualization. (1+2)
2. Explain how visual analytics combines visualization techniques with analytical capabilities. (3)
3. Provide examples of visualization methods suitable for each type: one-dimensional, two-dimensional, and multi-dimensional data. (1+1+1)
4. Describe the role of visual encodings in representing data visually. (3)
5. When visualizing tabular data with quantitative values, scatter plots are commonly used. (3)

Group B [5 × 6 = 30]

6. Discuss the principles and rules for graph drawing and labeling, including aspects like node placement, edge routing, and label positioning. Illustrate your answer with appropriate examples. (6)

OR

How can visualization be used to help analysts identify interesting patterns and trends in large datasets, and what are the limitations of these techniques? (3+3)

7. Describe the characteristics of time data in time series visualization. Explain visualization techniques for representing and analyzing time series data, and provide examples of suitable methods for different types of time series data. (2+4)
8. How can information overload be prevented in data visualization, and what techniques can be used to help viewers focus on the most important information? (3+3)

OR

What is visual mapping in the context of data visualization? Discuss the importance of visual mappings and provide examples of different types of visual mappings used to represent data effectively. (2+4)

9. Explain the key components of the visualization reference model and their roles in the data visualization process. (6)
10. Explain the concept of visual perception and its significance in data visualization. Discuss how human perception influences the design and interpretation of visual representations of data. (1+2+3)

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First Assessment 2080

Subject: **Economic Analysis**
Course No: **MDS 658**
Level: **MDS/II Year /IV Semester**

Full Marks: 45
Pass Marks: 22.5
Time: 2hrs

Candidates are required to give their answers in their own words as far as practicable.

Attempt ALL questions.

Group A [5 × 3 = 15]

1. Present the four properties and graphs of indifference curves.
2. In Table 2.1 price elasticity of demand is presented. Calculate the movement of the price elasticity formula from point B to point D and from D to B.

Table 2.1: Price Elasticity of Deman

Point	Px (Rs.)	Qx
A	8	0
B	7	1000
C	6	2000
D	5	3000
F	4	4000
G	3	5000
H	2	6000
I	1	7000
M	0	8000

3. Express the law of return to scales of the long-run production function.
4. Discuss the classification of market models, according to the number of firms, type of product, demand curve and entry condition, and give examples of each of them
5. Discuss Say's law in a money economy depends upon two conditions.

Group B [5 × 6 = 30]

6. Explain the Revealed Preference Approach and Assumptions. Draw a graph of the derivation of the indifference curve

OR

Discuss the oligopoly market with the help of Figure. Why marginal curve (MC) disappears in this type of market? Are these types of markets being exacting in Nepal?

7. Cobb-Douglas Production Function is assumed, $Y=A\sqrt{K}\ \sqrt{L}$. (Y is output, A is the productivity of resources, K is capital and L is labor unit). Suppose, A=12, K=36, L=4 Calculate Total Product (TP), Average Product (AP), and Marginal Product (MP). A & K held constant only labor inputs is variable i e , Labor 8, 9, 10, 11, 12, 13, 14, and 15
8. Discuss the full employment level of the labor market equilibrium. Illustrate the graph of labor market equilibrium.