Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2025

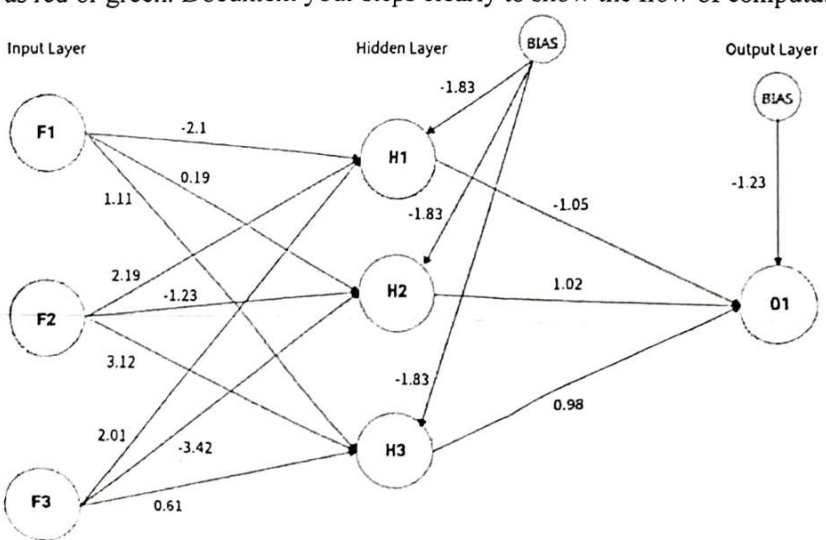
Course Code: SE333; Course Title: Artificial Intelligence

Sections & Teachers: A (MAT), B (AF), C (MMN), D, E, F (NF), G (MMN), H (NF), I (MMN)

Time: 2 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1	(a)	A drone calibration unit collects energy-efficiency readings from a malfunctioning power grid. The readings are represented as a set of states: $E = \{(1,14), (2,20), (3,18), (4,25), (5,22), (6,11), (7,13), (8,19), (9,24), (10,16)\}$ **Assess** the readings and form a state-space landscape using them. After that, interpret the relevant features of the state-space landscape to apply local search-based optimization algorithms.	[Marks-5]	CLO-4 Level – C5
	(b)	**Assess** the characteristics of the state-space landscape and apply a relevant algorithm to autonomously make decisions that maximize energy efficiency.	[Marks-5]	
2		Suppose you are working as a Machine Learning engineer in a company where two teams are struggling with the underfitting and overfitting problem. Now **analyze** the reasons behind these two problems and demonstrate how learning curve analysis can help to discover the further direction to fix these two issues.	[Marks-10]	CLO-3 Level- C4
3		A factory uses an automated sorting system to separate red and green objects. To assist the system, a neural network has been trained on a dataset where red = 0 and green = 1. The hidden layer nodes use ReLU activation, while the output layer uses Sigmoid activation. The complete network structure and trained weights are shown in Figure 1. A new batch of objects arrives with their feature values listed in Table 1. Using the trained network, **analyze** each input, calculate the hidden layer outputs, simulate the Sigmoid output of the final node, and classify each object as red or green. Document your steps clearly to show the flow of computation.  	[Marks-10]	CLO-3 Level – C4

F1	*F2*	*F3*
2.1	1.9	1.02
3.4	0.4	1.2

Table:1

4	Given sentence: "Sherlock Holmes stepped briskly into the room." **Assess** the stages of a Natural Language Processing (NLP) pipeline by drawing a detailed diagram that illustrates how this sentence is transformed step-by-step from raw text into a meaningful output.	**[Marks-10]**	**CLO-4 Level – C5**