

Daffodil International University
Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Fall 2026

Course Code: SE 111; Course Title: Computer Fundamentals
Sections & Teachers: MTE (A,B), WNI (C,D), MIS (E), MIR (F), SD (G), AAAS (H), MHM(I)

Time: 1 Hour 30 Mins

Marks: 25

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.]

I.	a)	<p>NOVA Systems is setting up a new computer lab for a university. When a lab computer is switched on, a special software is the first to be loaded into memory; it manages all the hardware parts, files and running programs so that the machine works properly. Students write programs in C++ and Java, and the lab uses a tool that translates a complete program into machine-readable form at one go, while another tool executes a Python program by converting it line by line. A tool that converts assembly-level programs into machine-level programs is also installed. When a new printer and a scanner are connected, small programs are installed so that the computer can control and monitor each specific device. Students then use a word processor to prepare their reports, a task-specific program that performs only a single job. Finally, the lab technician runs antivirus, backup and disk management tools to assist the main system software in keeping the lab computers healthy.</p> <p>Based on the scenario, classify the types of software described and explain each briefly along with its function.</p>	[Marks-6]	CLO-1 C2
	b)	<p>i) Convert $2C9_{16}$ to its Base 7 equivalent Number. 2036 ii) Convert 10110.01101_2 to its Base 10 equivalent Number. 26.40 iii) Convert 1011101101.101_2 to its Octal and Hexadecimal equivalent Numbers using the shortcut method. 1355.5 $2ED.A$</p>	[Marks-9]	

2.	<p>a) DIU Robotics Lab uses a safety interlock on its conveyor motor. The system is connected to two inputs: the start button (A) and the guard-door sensor (B). A red warning LED is designed with a strict rule: the LED turns OFF only when the start button is pressed and the guard door is fully closed at the same time. In all other situations, whether one condition is missing or both are missing, the red warning LED stays ON to indicate that the machine is not safe to run.</p> <p>Identify the logic gate used in the above scenario, write its truth table and illustrate its implementation using only NOR gates with a diagram.</p>	[Marks-3]	CLO-2 C4
cb)	<p>DIU Robotics Lab has an automatic charging dock for its mobile robots. The dock controller reads three sensors and drives a charging relay and a fault alarm.</p> <p>Inputs: A = 1 if the robot is docked; B = 1 if the battery is low; C = 1 if the charger is faulty. Outputs: Y (charging relay ON), Z (fault alarm ON).</p> <ol style="list-style-type: none"> The charging relay turns ON if the robot is docked and the battery is low, or if the robot is docked, the battery is <u>not</u> low and the charger is <u>not</u> faulty. The alarm sounds if the charger is faulty and the robot is docked, or if the charger is faulty, the robot is docked and the battery is low. <p>Derive the Boolean expression for each output, and then:</p> <ol style="list-style-type: none"> Minimize each expression using the laws of Boolean algebra, identifying the law used in each step. Diagram the logic circuit of the minimized expressions using AND, OR and NOT gates as required. 	[Marks-7]	$Y = AB + AB'C'$ $Z = CA + CAB$