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**Certified LabVIEW Developer Examination**

Examinee \_\_\_\_\_ Date: \_\_\_\_\_

Administrator \_\_\_\_\_ Date: \_\_\_\_\_

**Instructions:**

If you did not receive this exam in a sealed envelope stamped “NI Certification,” **DO NOT ACCEPT** this exam. Return it to the proctor immediately. You will be provided with a replacement exam.

- **Please do not detach the binding staple of any section. If any part of the exam paper is missing or detached when returned to National Instruments, you will be deemed to have failed the exam.**
- This examination may not be taken from the examination area or reproduced in any way. You may not keep any portion of this exam after you have completed it.
- Please do not ask the proctor for help. If you believe the intent of any part of the exam is not clear, you may make appropriate assumptions. Please document your assumptions either on the question paper or on the LabVIEW block diagram.
- The exam requires you to develop a LabVIEW application based on a set of specifications.
- A computer with a standard installation of LabVIEW is the only reference allowed for the examination. Externally developed code and third party tools are not allowed in the exam.
- You may use LabVIEW design patterns, templates, and examples available in the development environment as a guide/resource for the application development.
- The application must be specifically developed for the exam submission.
- Submit your finished application on the disk provided.
- Total time allocated for the exam: 4 hours
- Exam passing grade: 75%

**Grading:**

The application development exam consists of a total of 40 points which are allocated as follows:

- Programming style (15 points)
- Functionality (15 points)
- Documentation (10 points)

**IMPORTANT:**

- When you have completed the exam, place the exam document, the disk with the saved application, and any deliverables in the envelope provided.
- Please SEAL the envelope.
- Give the sealed envelope to your proctor.

**Application Development**  
**Section I: General Requirements**

The Certified LabVIEW Developer exam tests your ability to develop a LabVIEW application.

The application should:

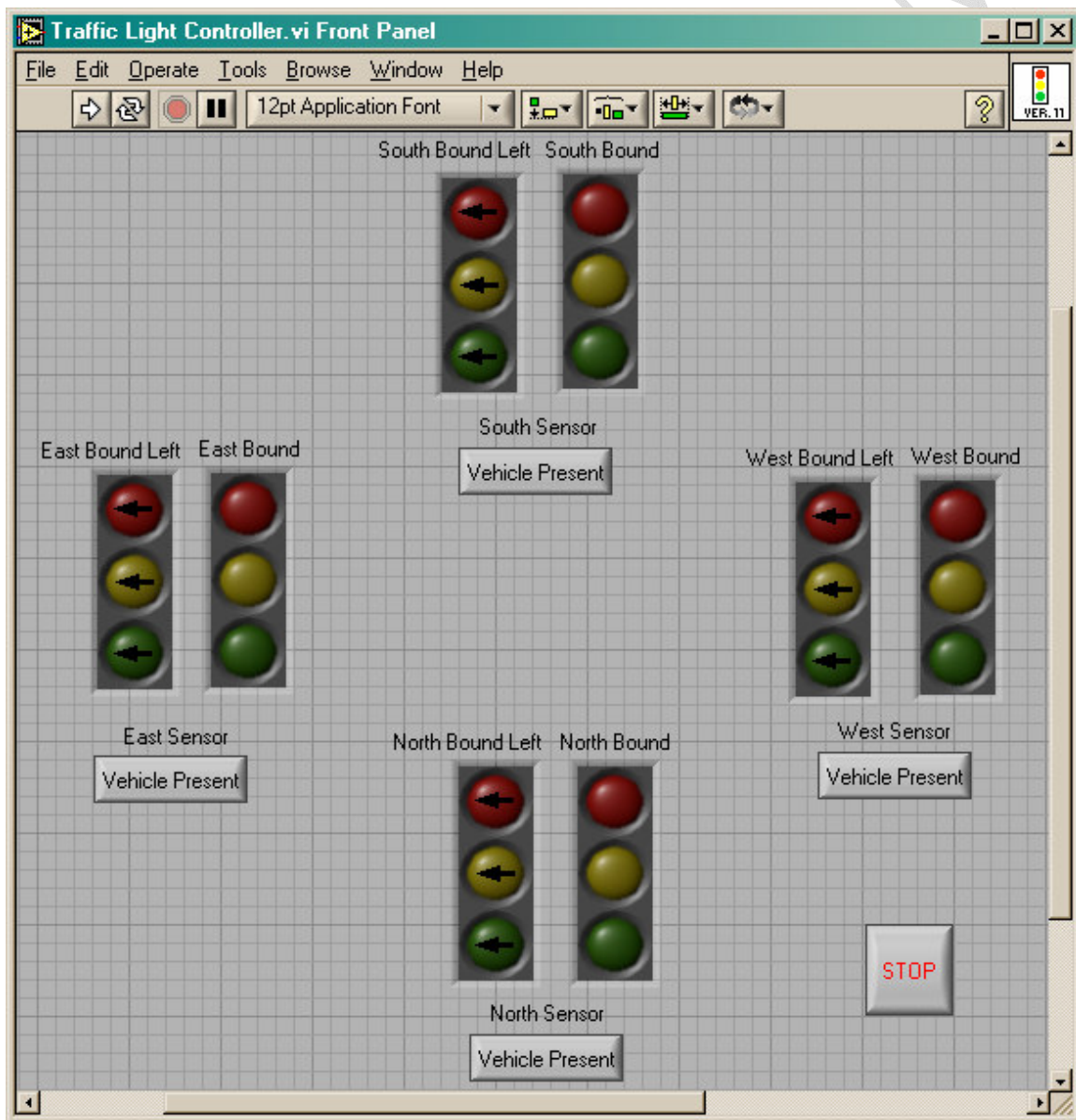
- Function as specified in Section II b of this document.
- Conform to LabVIEW coding style and documentation standards (found in LabVIEW documentation – LabVIEW Development Guidelines).
- Be created expressly for this exam using VIs and functions available in LabVIEW. Templates, examples, or code developed outside the bounds of this exam are not acceptable for use in the application.
- Be hierarchical in nature. All major functions should be performed in subVIs.
- Use a state machine that either uses a type defined enumerated control, queue, or Event structure for state management.
- Be easily scalable to add more states / features without having to manually update the hierarchy.
- Minimize the use of excessive structures, variables (locals / globals) and Property Nodes.
- Respond to front panel controls (within 100 ms) and not utilize 100% of CPU time.
- Close all opened references and handles where used.
- Be well documented and include the following:
  - Labels on appropriate wires within the main VI and subVIs.
  - Descriptions for each algorithm.
  - Documentation in VI Properties » Documentation for both main VI and subVIs.
  - Tip strip and Description for front panel controls and indicators.
  - Labels for constants

**Application Development**  
**Section II: Application Requirements**  
**Traffic Light Controller**

**Task:**

Your company has received a contract to produce a traffic light controller for a local city government. The purpose of the traffic light controller is to maintain traffic at a heavily used 4-way intersection.

You have been assigned to create the software for this system using LabVIEW. You will create the software for one intersection that includes north, south, east, and west bound traffic, with each direction having a left-hand turn lane.



**General Operation:**

The traffic light controller provides for green, yellow, and red lights for each direction. In addition, a second green-yellow-red light must be provided for the left-hand turn lane.

The period of time the lights should be 'ON' are as follows:

**Red:** 4 seconds

**Yellow:** 2 seconds

**Green:** 4 seconds

The pattern of the lights with no left-turn sequence should be according to the following table:

North Bound	South Bound	East Bound	West Bound
Green	Green	Red	Red
Yellow	Yellow	Red	Red
Red	Red	Green	Green
Red	Red	Yellow	Yellow

<Repeat>

The pattern of lights with a left-turn sequence for an East Bound vehicle should be according to the following table:

North Bound	South Bound	East Bound	West Bound
Green	Green	Red	Red
Yellow	Yellow	Red	Red
Red	Red	Left Green	Left Green
Red	Red	Left Yellow	Left Yellow
Red	Red	Green	Green
Red	Red	Yellow	Yellow

<Repeat>

The left turn sequence should only be inserted if a vehicle is positioned over the left turn lane sensor at the time the left turn sequence should start.