COMSATS University Islamabad, Abbottabad Campus
Department of Computer Science

Final Term Examination – (FALL 2025)

Class: BSSE 7A,7B,7C | Date: 26 Dec 2025

Subject: Formal Method | Instructor: Malik Ihtasham Asif

Total Time Allowed: 180 Minutes | Max Marks: 50 Marks

Name: _____ **Reg. #** _____

[CLO-1, Marks 12]

Q1. Explain why every programming language with a well-defined semantics can be considered a Formal Specification Language (FSL), but not every FSL is a programming language? **(Marks:04)**

Q2. List and briefly explain the key characteristics of high-quality software requirements. **(Marks:04)**

Q3. Differentiate between model-oriented and property-oriented specification styles. Also, list the formal specification languages that fall under each category? **(Marks:04)**

[CLO-2, Marks 8]

Q4 Develop a complete Z specification for a simple Birthday Book system. Your specification must include clearly defined error schemas wherever appropriate. The required components are: **(Marks:08)**

a) State Schema
b) Initial State Schema
c) Find a Birthday Operation
d) Add a Birthday Operation

[CLO-3, Marks 20]

Q5. Design a Petri Net for a Two-Way Traffic Light System. **(Marks:07)**

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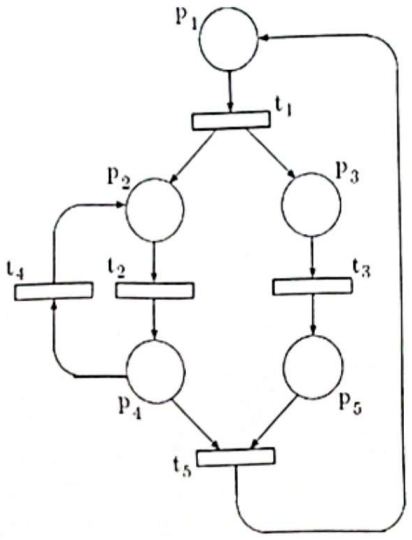
Your Petri Net should include:

- Separate traffic light cycles for the two directions
- Green, Yellow, and Red phases for each direction.
- Traffic Light Sequence G → Y → R
- Petri net should be bounded and Live

Q6. Draw at least 4-level computational tree for the following temporal logic formulas: **(Marks:06)**

(a) AGp (b) EFp (c) AX p

Q7 Draw the reachability tree. Given the initial marking $M_1 = (0,1,0,0,1)$ of a Petri net **(Marks:07)**



[CLO-4, Marks 10]

Q8. Develop a specification-based (black-box) testing approach for a login system. Your test case should include the following fields: Test Case ID, Objective, Pre-requisites, Input Test Data, Steps to be Executed, Expected Results. **(Marks:10)**

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