

National University of Computer and Emerging Sciences, Lahore Campus



| | | | |
|-----------------|---------------------------------|--------------|----------------|
| Course Name: | Formal Methods | Course Code: | SE2003 |
| Degree Program: | BS SE | Semester: | Spring 2023 |
| Exam Duration: | 60 Minutes | Total Marks: | 30 |
| Paper Date: | 25 th February, 2023 | Weight | 20 |
| Section: | ALL | Page(s): | 2 |
| Exam Type: | Midterm-I | Instructor | Dr. Wafa Basit |

Student: Name _____
Instruction/Notes.

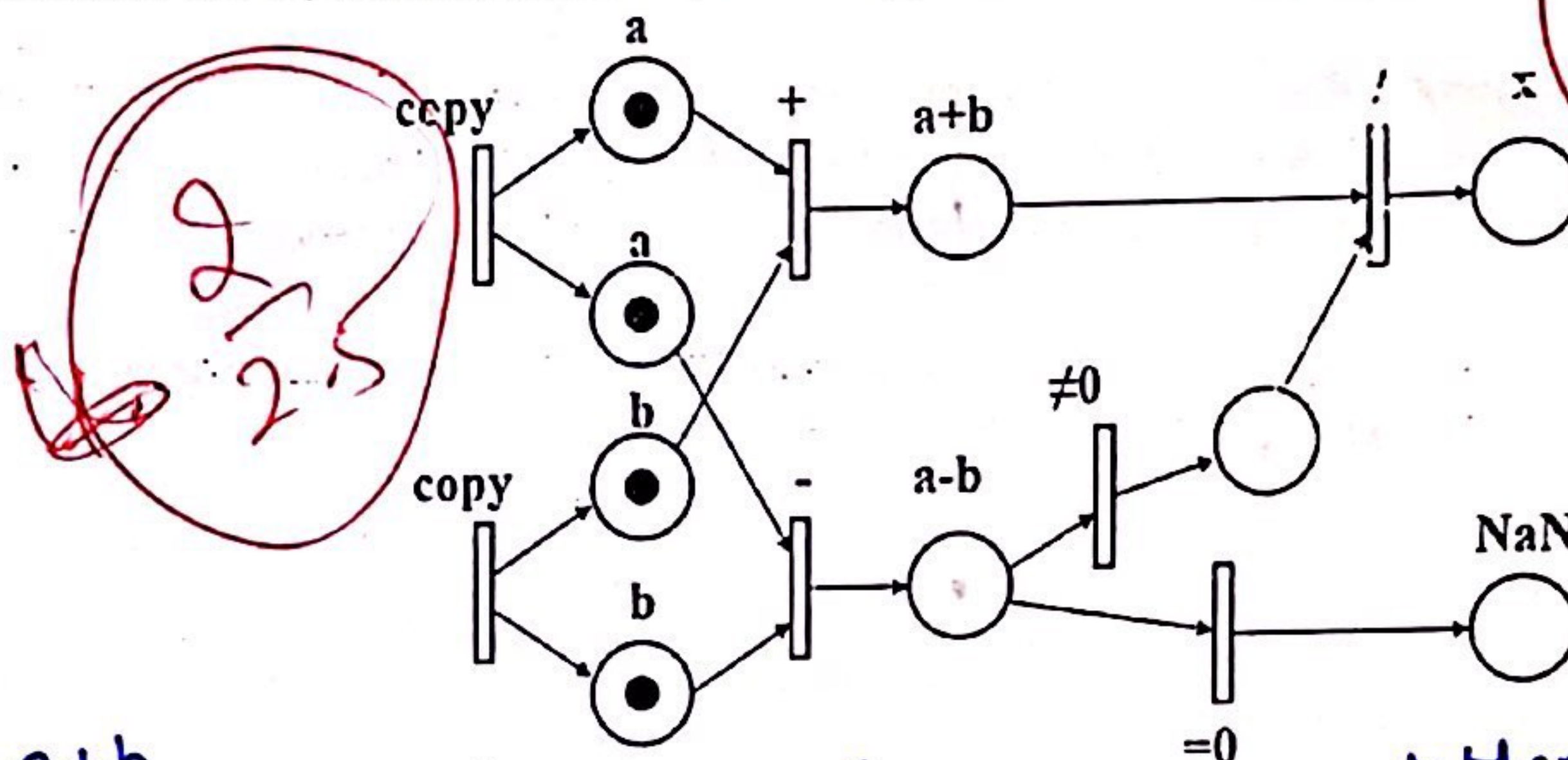
Ro _____

Section: 6A

- Attempt all questions.
- Make assumptions where necessary
- In case of multiple solutions, mention the final one
- Attach the question paper with the answer sheet.
- Question # 1 has to be attempted on question paper.
- Please draw neat and understandable diagrams

Question # 1 (2.5 + 2.5) points

1. Write down the equation modeled by following Petrinet.

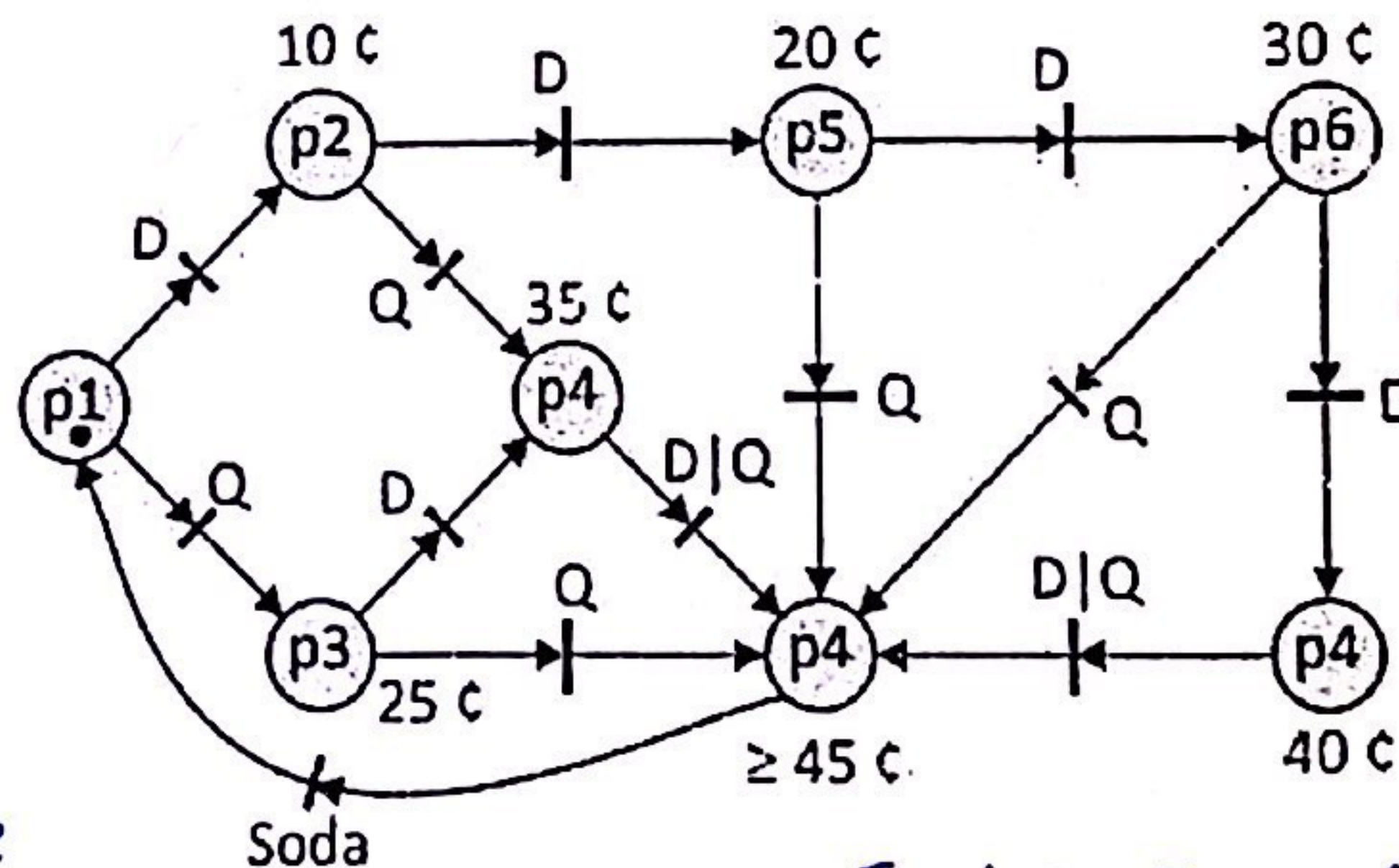


Answer:

$$\frac{a+b}{a-b} \therefore a-b \neq 0 \vee \text{NaN} \therefore a-b = 0$$

* Here \vee means OR

2. Following Petrinet models a simple soda vending machine where customer pays in Dimes (10c) or Quarters (25c). A soda is worth 45c. What happens if a customer overpays?



Possible overpaying scenario
 $25 + 10 + 10 = 55$
 $10 + 25 + 10 + 10 = 55$
 $10 + 10 + 25 + 10 = 55$
 $10 + 10 + 10 + 25 = 55$
 * $25 + 25 = 50$

* Consider a scenario if customer inserts

→ 25c + 25c.

Then he will receive the soda and move back to P1. But $50 - 45 = 5c$ will be his budget.

Answer: So next time None of the states P_3 or P_2 will work

Department of Computer Science

Page 1 of 2

because $25 + 5 = 30$ & $20 + 5 = 15$. The system will halt.

Question # 2: Following Z Schema defines the state space of a simple counter with a current value and a limit

(5+5+5+5+5) points

| |
|--------------------|
| Counter |
| value, limit : N |
| value \leq limit |

Here is a schema describing an initial state for the counter

| |
|-------------|
| InitCounter |
| Counter |
| value = 0 |
| limit = 100 |

Note: Write down all required pre and post conditions for the following schemas. Also, mention the part number to avoid any confusion on the answer sheet.

1. Write down an increment operation schema which increments the value of the counter by one.
2. Write an operation schema which adds its input to the value of the counter, and outputs the new value.
3. Write an operation schema which inputs a number and adds its square to the value of the counter, producing the new value as output.
4. Write down a Schema to print a *limit_reached* message when the counter reaches its limit.
5. Draw a Petrinet for the schema operation written by you in part (3).

Good Luck