

Quiz 2

● Graded

Student

Abhinav Shripad

Total Points

14 / 14 pts

Question 1

ROBDD

7 / 7 pts

✓ + 4 pts ROBDD Order

✓ + 3 pts ROBDD construction

Question 2

d-DNNF

7 / 7 pts

✓ + 5 pts Construction of d-DNNF

✓ + 2 pts Conditioning of d-DNNF

+ 0 pts Not correct

COL876: SAT Solvers and Automated Reasoning

Quiz 2

Date: 18/10/2024

Maximum Time: 60 minutes

Maximum Marks: 15

Please carefully read the instructions below before attempting the exam:

- Write your name and entry number on each sheet.
- You will be provided with rough sheets; however, you are required to write the solutions to the questions in the space provided below. Please ensure your writing is neat. In case of any confusion in the writing, the instructor reserves the right to assume the worst-case scenario and award marks accordingly.
- No clarifications will be given. If you think a question is unclear, write your assumption and then solve the question under your stated assumption.
- There are two questions. Have fun – do not stress out.

Name: Abhinav Rajesh Shripad Entry No. 2022CS11336

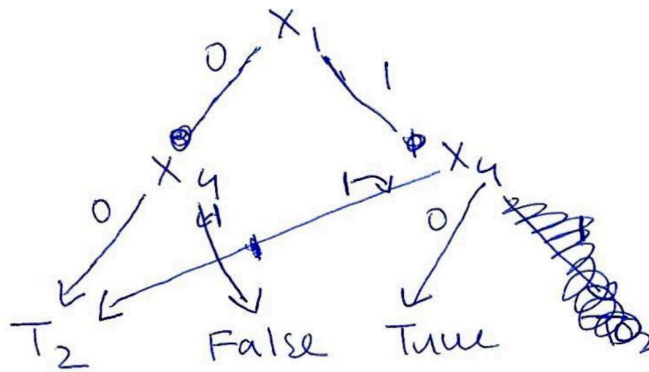
Question 1 (7 marks) Let F be a Boolean function defined over six variables –

$$F(x_1, x_2, x_3, x_4, x_5, x_6) = \begin{cases} 1 & \text{If } (2^2 \times x_1 + 2^1 \times x_2 + 2^0 \times x_3) > (2^2 \times x_4 + 2^1 \times x_5 + 2^0 \times x_6) \\ 0 & \text{Otherwise} \end{cases}$$

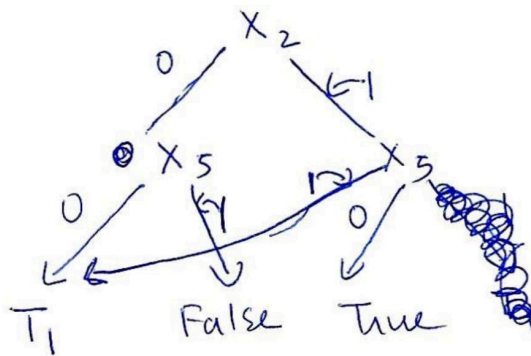
1. Provide a variable order that will lead to the construction of the smallest ROBDD. No need for explanation, just the variable order.
2. Construct a ROBDD for this function using the order you provided in the previous question.

x_1 x_4 x_2 x_5 x_3 x_6
Ordering ↑

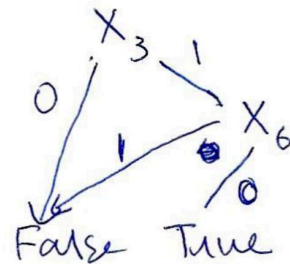
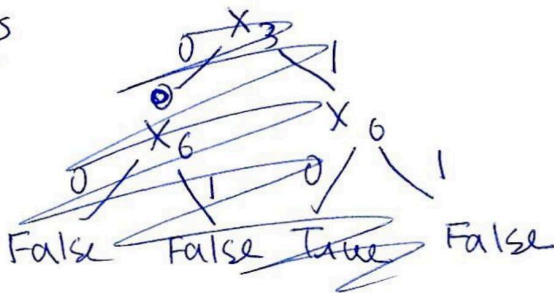
ROBDD is



T₂ is



T₁ is



Question 2 (7 marks) Let φ be a formula:

$$\varphi := (a \vee b \vee c) \wedge (a \vee d \vee e) \wedge (\neg a \vee \neg b \vee c) \wedge (\neg a \vee \neg d \vee e)$$

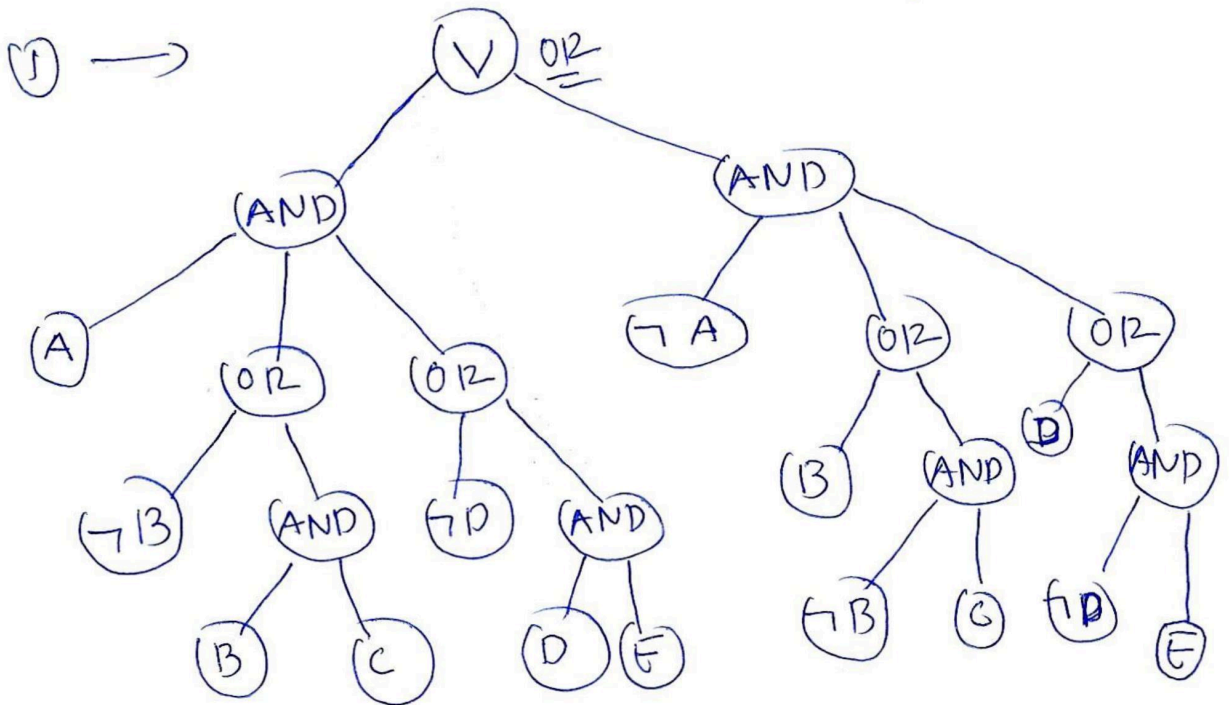
1. Construct d-DNNF representation φ_{dDNNF} of φ .

2. Let us define **Conditioning (Darwiche, 1999)**:

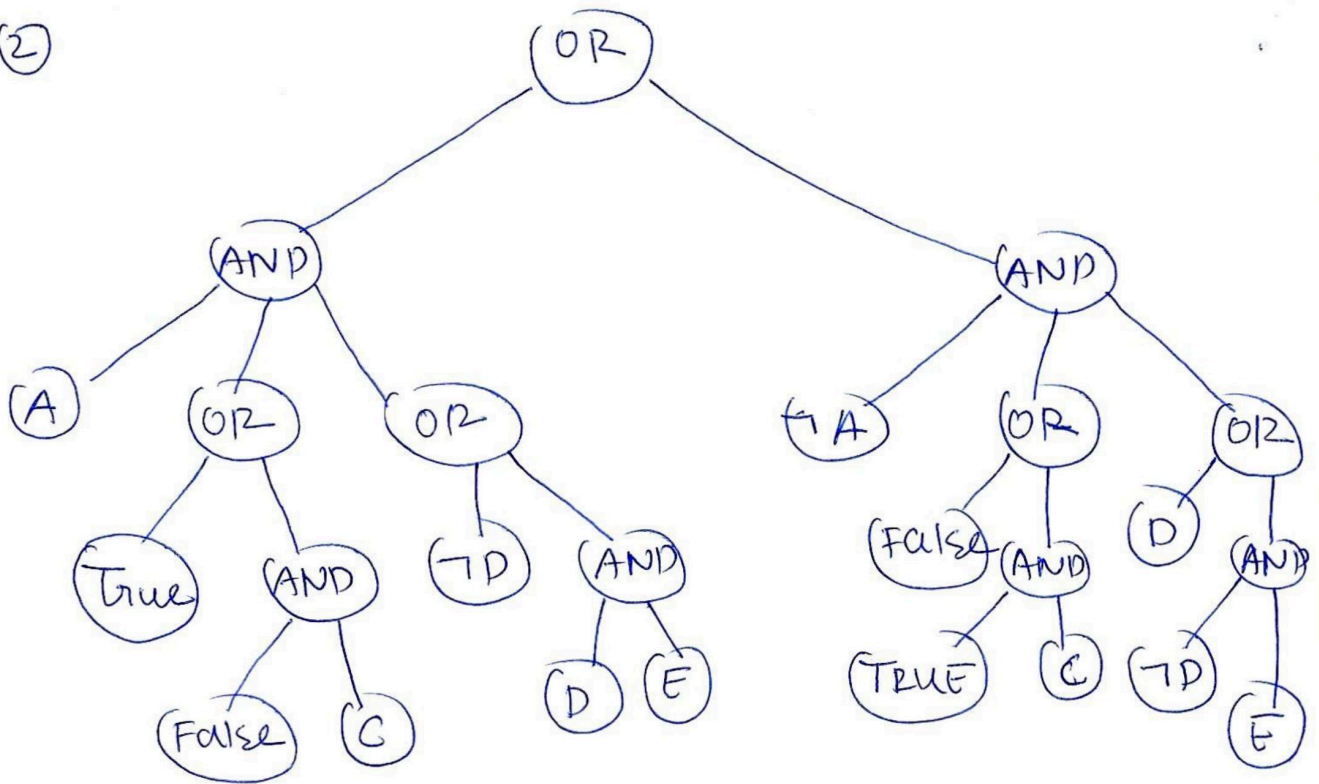
Let φ be a propositional formula, and let γ be a subset of literals of φ . The conditioning of φ on γ , noted $\varphi|_{\gamma}$, is the formula obtained by replacing each variable x_i of φ by true if x_i is a positive literal of γ , and by replacing each variable x_i of φ by false if $\neg x_i$ is negative literal of γ .

Question: Do conditioning of φ_{dDNNF} on $\gamma = \{\neg b\}$, that is, provide $\varphi_{dDNNF}|_{\neg b}$

Observe that φ is equisatisfiable as
 $F[x=1]$ OR $F[x=0]$ - and both don't share a model
 (diff at x)



(2)



Can be simplified to

