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Courses » Embedded Systems-- Design Verification and Test

Announcements **Course** Ask a Question Progress Mentor FAQ

Unit 8 - BDD and Symbolic Model Checking

Course outline

How to access the portal

Introduction and Modeling

Modeling and Synthesis issues

Architectural Synthesis of Hardwares

System-level Design

Temporal Logic

Model Checking

BDD and Symbolic Model Checking

Binary Decision Diagram

Use of OBDDs for State Transition System

Symbolic Model Checking

Quiz : Assignment-7

Assignment-7

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-09-19, 23:59 IST.**

1) Binary Decision Diagram (BDD) construction of a Boolean expression is based on **1 point**

- Shannon expansion
- SOP representation
- POS representation
- Both b & c

No, the answer is incorrect.

Score: 0

Accepted Answers:

Shannon expansion

2) How many nodes are required to create a Binary Decision Tree having 4 variables? **1 point**

- 2⁴
- 2⁵
- 2⁵-1
- 2⁴-1

No, the answer is incorrect.

Score: 0

Accepted Answers:

2⁵-1

3) Find the number of terminal nodes of a Boolean function $f(a,b,c)=a'b+abc+b'c'$ in BDT and BDD representation. **1 point**

- BDT=5, BDD=5

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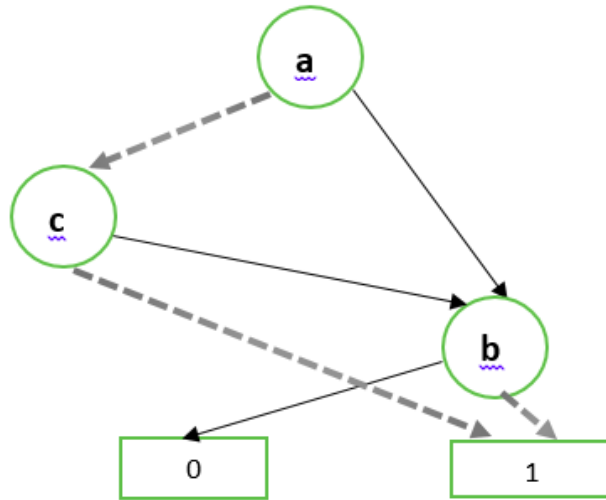
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Accepted Answers:
BDT=8, BDD=2

4) Which Boolean function is represented by the given ROBDD?

1 point



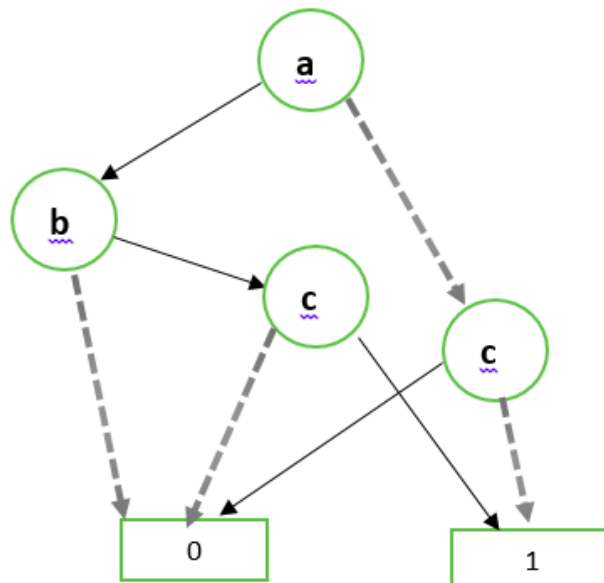
- $f = b'+a'c'$
- $f = a'+b'c'$
- $f = a'b'+c'$
- $f = a'+b'+c'$

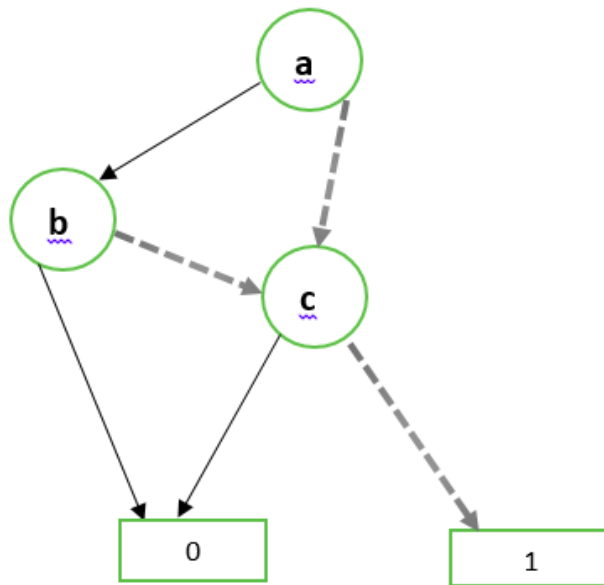
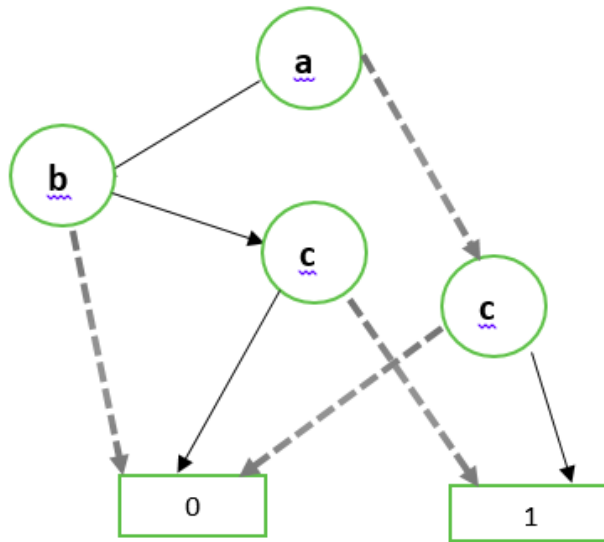
No, the answer is incorrect.
Score: 0

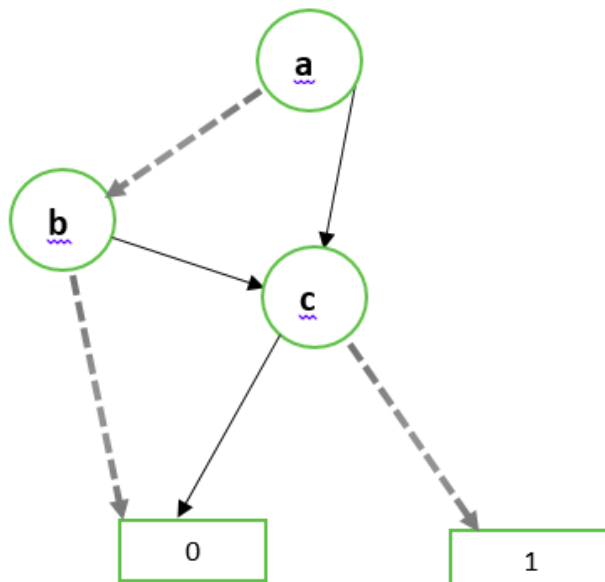
Accepted Answers:
 $f = b'+a'c'$

5) Which one is the ROBDD for the given Boolean expression $f=abc+a'c'$? Assume variable ordering is <a,b,c>

1 point



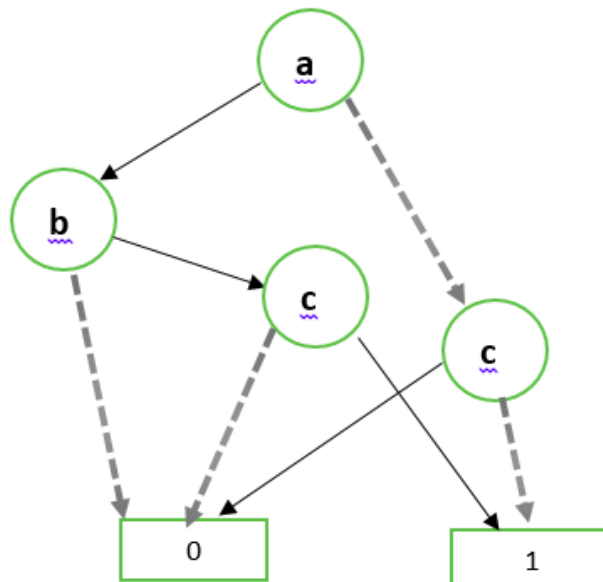




No, the answer is incorrect.

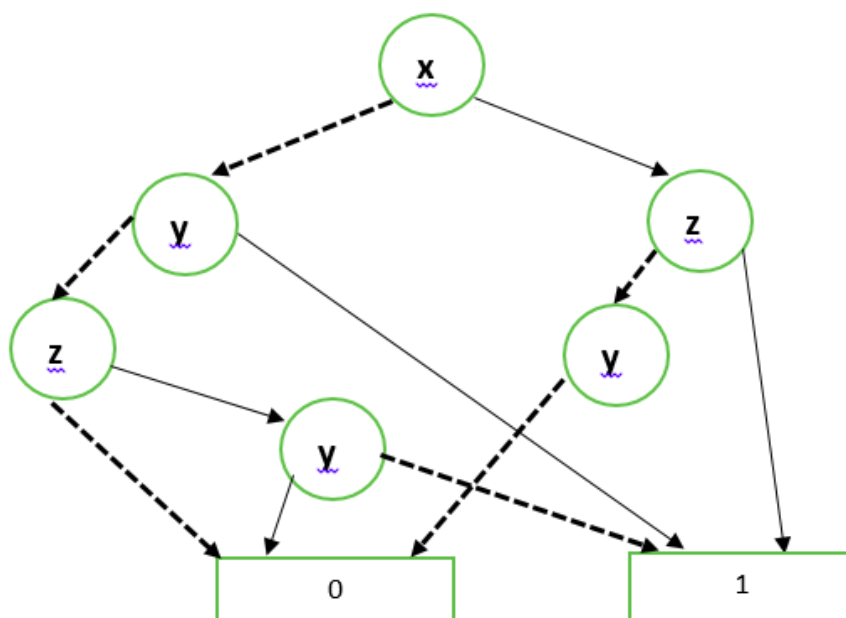
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Accepted Answers:



6) Which among the following are false for the given BDD, where
 path 1 : x-y-z-y-1
 path 2 : x-y-z-y-0

0 points



- Both path 1 and path 2 are inconsistent
- Path 1 is consistent and path 2 is inconsistent
- Path 1 is inconsistent and path 2 is consistent.
- Both path 1 and path 2 are consistent.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Path 1 is consistent and path 2 is inconsistent

7) What will be the optimal ordering of variables for the Boolean function $f=ab+a'c+bc'd$?

1 point

- <a,b,c,d>
- <a,c,d,b>
- <a,b,d,c>
- <a,c,b,d>

No, the answer is incorrect.

Score: 0

Accepted Answers:

<a,c,d,b>

8) Let B_x and B_y are two ROBDDs representing Boolean function $f(a,b,c)=a'b+ac+bc'$ with variable ordering <a, b, c> and <c, a, b> respectively. The number of nodes in B_x and B_y are :

1 point

- $B_x=5, B_y=5$
- $B_x=5, B_y=6$
- $B_x=6, B_y=5$
- $B_x=6, B_y=6$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$B_X=6, B_Y=5$

9) Consider the Boolean function of 2-bit comparator, $f(a_1, a_2, b_1, b_2) = (a_1 \text{ XNOR } b_1) \cdot (a_2 \text{ XNOR } b_2)$. Consider a ROBDD that represents f with variable ordering $\langle a_1, a_2, b_1, b_2 \rangle$. How many nodes will this ROBDD have? **1 point**

- 10
- 11
- 12
- 14

No, the answer is incorrect.

Score: 0

Accepted Answers:

11

10) Consider the Boolean function $f(a, b, c, d) = ab'c + ab + c'd + bcd$. Construct ROBDD B_f to represent f . Assume order of variables is $\langle a, b, c, d \rangle$. The number of nodes in B_f is: **1 point**

- 9
- 8
- 7
- 6

No, the answer is incorrect.

Score: 0

Accepted Answers:

8

11) Consider the boolean function in the question 10. Construct ROBDDs B_X and B_Y to represent $\text{restrict}(0, c, B_f)$ and $\text{restrict}(1, c, B_f)$, respectively. Assume order of variables is $\langle a, b, c, d \rangle$. The number of nodes in B_X and B_Y are: **1 point**

- $B_X = 5, B_Y = 5$
- $B_X = 6, B_Y = 5$
- $B_X = 5, B_Y = 6$
- $B_X = 6, B_Y = 6$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$B_X = 5, B_Y = 5$

12) Consider the ROBDDs constructed in question 11 using the Boolean function given in question 10. Construct ROBDD B_Z to represent $\text{exists}(c, B_f)$ using B_X and B_Y . Assume order of variables is $\langle a, b, c, d \rangle$. The number of nodes in B_Z are: **1 point**

- 5
- 6
- 4
- 3

No, the answer is incorrect.

Score: 0

Accepted Answers:

4

13) Let $f(x, y) = x(y + x')$ be a Boolean function. What will be the restrictions of f with respect to x , if $x=0$. and $x=1$ respectively? **1 point**

- 0, xy
- x' , xy
- 0, y
- x' , $x+y$

No, the answer is incorrect.

Score: 0

Accepted Answers:

0, y

14) Which among the following is True? **1 point**

- $\text{Pre}_\forall(X) = S - \text{Pre}_\exists(X)$
- $\text{Pre}_\forall(X) = S - \text{Pre}_\exists(S-X)$
- $\text{Pre}_\exists(X) = S - \text{Pre}_\forall(X-S)$
- $\text{Pre}_\exists(X) = S - \text{Pre}_\forall(S-X)$

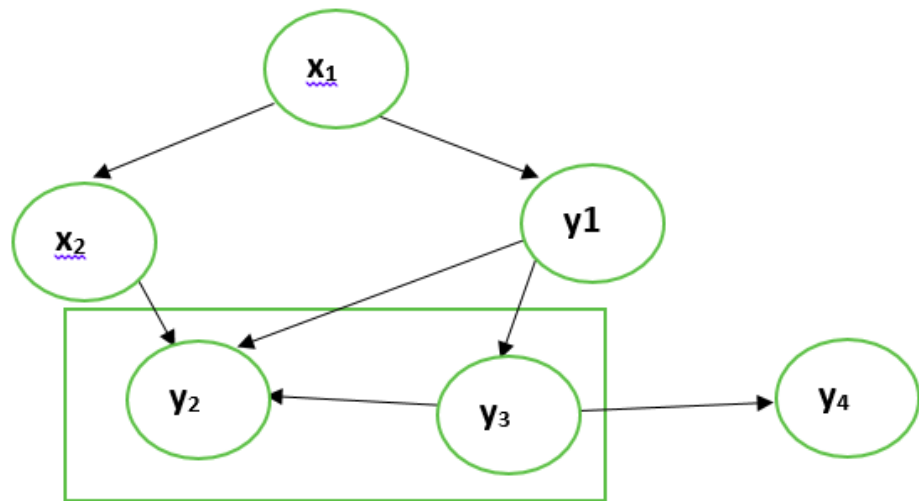
No, the answer is incorrect.

Score: 0

Accepted Answers:

$\text{Pre}_\forall(X) = S - \text{Pre}_\exists(S-X)$

15) What is $\text{Pre}_\exists(X)$ for the given state transition diagram where $S = \{x_1, x_2, y_1, y_2, y_3, y_4\}$ and $X = \{y_2, y_3\}$? **1 point**



- $\{x_2, y_1, y_2, y_3\}$
- $\{x_2, x_1, y_1, y_3\}$
- $\{x_2, y_1, y_3\}$
- $\{y_1, y_3, y_4\}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\{x_2, y_1, y_3\}$

16) What is $\text{Pre}_\forall(X)$ for the state transition diagram shown in Question 15?

1 point

- {x2,y1}
- {x2,y1,y3}
- {x1,x2,y3}
- {x1,x2,y1,y3}

No, the answer is incorrect.

Score: 0

Accepted Answers:

{x2,y1}

17) Which of the following symbolic model checking function returns $\text{Pre}_\exists(B_\varphi)$, where B_φ is the OBDD for set of states where φ is true? 1 point

- $\text{EF}(B_\varphi)$
- $\text{AF}(B_\varphi)$
- $\text{AG}(B_\varphi)$
- $\text{EX}(B_\varphi)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\text{EX}(B_\varphi)$

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