Answers:

1. d 2. a 3. d 4. c 5. d 6. c 7. b 8. a 9. b 10. d
11. a 12. a 13. b 14. b 15. a 16. c 17. c 18. b 19. b #

Hints:

19 Take 1101 → the output is 0011, which is 2's complement of 1101.

1 picture

Fill in the Blanks

1. A synchronous circuit is controlled by ————-.
2. The operations in an asynchronous circuit are controlled by a number of ————-.
3. The output of combinational circuits is a function of ————- .
4. The output of sequential circuits is a function of———— .
5. Binary adder is a ————.

6. Modulo 3 binary counter has ————states.
7. An FSM can be defi ned as a type of machine whose past histories can affect its in ———— a ———— of ways.
8. Two states Si and Sj of machine M are said to be equivalent if they produce the same———— for ———— an applied to the machine M, considering Si and Sj as the initial states.
9. If two states are k-distinguishable, then they are ———— equivalent for k = k to 1.
10. The equivalent partition is ————.
11. Incompletely specifi ed machines are those machine where for all states for all inputs the ———— or ———— or both are not mentioned.
12. Minimal machine is the ————of the machines obtained by minimizing an incompletely specifi ed machine.

13. A merger graph of a machine M of 'n' states is an ———— graph.
14. In a merger graph, there will be an ———— arc if the next states of the two states (vertices) do not confl ict.
15. In a merger graph, there will be no arc between the two vertices if the ———— of the pair of states confl ict.

16. Two states, say S_i and S_j, are said to be compatible, if both of them give the same————- strings for all ——— strings applied to the machine separately, considering S_i and S_j as the initial states.
17. A compatibility graph is a ——— graph.
18. A subgraph of a compatibility graph is called ————- if for every vertex in the subgraph, all outgoing arcs and the terminal vertices of the arcs also belong to the subgraph.
19. A merger table is a substitute application of ————.

20. From a merger graph, we can get the compatible pairs and ———.
21. A vanishing connection matrix is used to fi nd whether a machine is ———or not.
22. A synchronizing tree method is used to fi nd whether a machine is ———-or not.
23. A contracted table method is used to fi nd whether a machine is ———or not.
24. The order of defi niteness μ =———- , if the length of the longest path in the testing graph is l.
25. The order of defi niteness of a machine is the ———- of the synchronizing tree.
26. A machine is called information lossless if its ———- state, ——— state, and ———- string are suffi cient to determine uniquely the input string.
27. A machine which is not lossless is called ———-.

Answers:

1. clock pulses
2. completion and initialization signals
3. present I/P
4. external I/P and present stored information
5. sequential circuit
6. three
7. future behaviour, finite number
8. output sequences, input string
9. $k-1$
10. unique
11. next state, output
12. minimum
13. undirected
14. uninterrupted
15. outputs
16. output, input
17. directed
18. closed
19. merger graph
20. implied pairs
21. finite
22. definite
23. definite
24. $l+1$
25. maximum label
26. initial, final, output
27. lossy

2 picture

Exercise

1. Defi ne an FSM. Mention the capabilities and limitations of an FSM.

2. What is the usefulness of a sequence detector? Can it be called a machine? Mention points in support of your answer. What do you mean by overlapping sequence? What is the need of considering overlapping sequence

in constructing a sequence detector?

3. i) Design a two input two output sequence detector which generates an output '1' every time the sequence 0101 is detected. And for all other cases, output '0' is generated. Overlapping sequences are also counted.
   ii) Design a two input two output sequence detector which generates an output '1' every time the sequence 1101 is detected. And for all other cases output '0' is generated. Overlapping sequences are also counted.

4. Design a modulo 8 binary counter using JK flip flop.

5. What is the benefi t of minimizing an FSM? What do you mean by equivalent partition of a machine? Prove that equivalent partition of an FSM is unique.
   i) Find the equivalent partition for the following machine.

	Next State,O/P	
Present State	X=0	X=1
A	E, 0	G, 0
B	G, 0	F, 0
C	H, 0	B, 1
D	G, 0	A, 1
E	A, 0	G, 0
F	A, 0	A, 0
G	F, 0	A, 0
H	C, 1	A, 1

From here, minimize the machine.

ii) Find the equivalent partition for the following machine.

	Next State,O/P	
Present State	X=0	X=1
A	E, 0	D, 1
B	F, 0	D, 0
C	E, 0	B, 1
D	F, 0	B, 0
E	C, 0	F, 1
F	B, 0	C, 0

Find the shortest input sequence that distinguishes state A from state E.

From here, minimize the machine.

6. Why are incompletely specified machines called incomplete? What is the necessity of simplifying these types of machines?

i) Simplify the following incompletely specified machine

	Next State,O/P	
Present State	X=0	X=1
A	B, 1	C, 0
B	A, 1	-, 1
C	-, -	B, 0

ii) Simplify the following incompletely specified machine

	Next State,O/P	
Present State	X=0	X=1
A	E, 1	D, 0
B	E, 0	-, -

	Next State,O/P	
Present State	X=0	X=1
C	-, 0	B, -
D	A, 0	D, 1
E	A, -	B, 0

7. Defi ne minimal machine. What are differences between minimized machine and minimal machine? Why can the general equivalent partition method not be used to minimize an incompletely specifi ed machine?
i) Find a minimal machine from the minimum machines for the following machine considering the unspecifi ed outputs as '0' or '1'.

	Next State,O/P	
Present State	X=0	X=1
A	B, 1	C, -
B	A, -	C, 0
C	A, 1	B, 0

8. Define a merger graph. Can a merger graph be drawn for a completely specified machine? Give reason in favor of your answer.
i) Develop a merger graph for the following incompletely specified machine. From there, find the compatible pairs.

			Next State,z	
Present State	I_1	I_2	I_3	I_4
A	$D,1$	$C,-$	$-,-$	$D,1$
B	$-,-$	$D,-$	$A,0$	$-,-$
C	$E,1$	$-,-$	$B,0$	$C,1$
D	$-,-$	$D,1$	$E,0$	$C,1$
E	$-,-$	$A,0$	$-,-$	$-,-$

ii) Defi ne a compatible pair and implied pair. What is the relation between these two? Defi ne a compatible graph. What are differences between a merger graph and a compatible graph?
Defi ne closed covering and minimum closed covering.
iii) For the previously given machine develop a compatible graph and from there develop the minimal machine.
9. Develop a merger graph from the following machine.