

Foundations of Information Systems

Final Exam

February 17, 2026

1. (a) Derive a Boolean algebra expression for the following binary truth table:

a	b	c	z
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

- (b) Simplify your expression as much as possible.
(c) Draw a circuit diagram representing your (possibly simplified) expression.

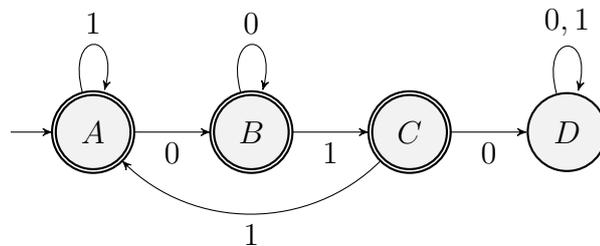
(5+5+5)

2. Show your work when answering the following questions.

- (a) Convert $(60.625)_{10}$ into hexadecimal.
(b) Convert $(10100.011)_2$ into decimal.
(c) Add the 8-bit two's complement integers 0101 0001 and 0101 1101. Do you get overflow?

(5+5+5)

3. Consider the following FSA:



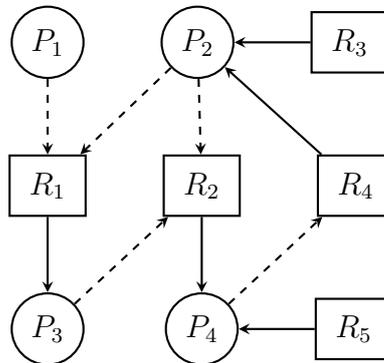
- (a) Is the input string 110100 accepted? List the sequence of states that the FSA takes when parsing this string.

- (b) What strings does this FSA accept? Answer in words and state a corresponding regular expression.

(5+5)

4. Are the following statements true or false? Give a *brief* explanation for each. (True/False answers without explanation will not earn credit!)

- (a) In an operating system with dynamically managed virtual memory, every page of memory allocated to a process has a page table entry.
- (b) In an operating system with dynamically managed virtual memory, every page of memory addressable by a process has a page table entry.
- (c) In an operating system with dynamically managed virtual memory, physical memory must be at least as large as the combined size of all pages allocated to processes.
- (d) To avoid deadlock, it is necessary to design a system such that none of the following four conditions may occur: mutual exclusion, circular wait, no pre-emption, holding while waiting.
- (e) Deadlock implies Starvation.
- (f) Deadlock is possible in the following resource allocation graph. (Solid edges: Resource R_i is held by Process P_j . Dashed edges: Process P_k is waiting for resource R_ℓ .)



(2+2+2+2+2+2)

5. (a) Explain the good advice that *RAID is not a backup*. (Mention at least two different aspects in your answer.)
- (b) If it's not a backup, what is it good for then?

(5+3)

6. (a) The following message is received in Hamming-(8,4) encoding. Decode, correcting a single-bit error or reporting double-bit error as appropriate:

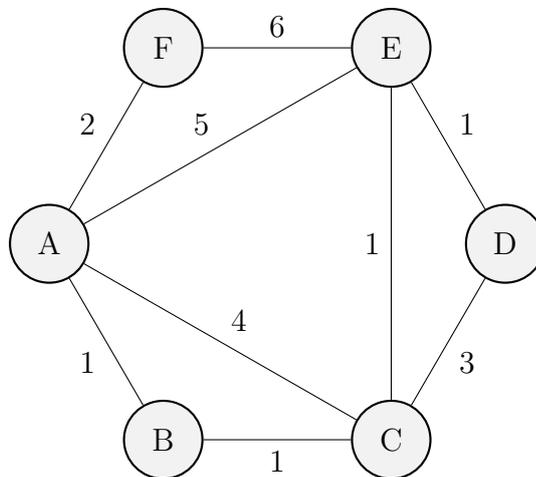
0101 1101

Use the bit-ordering convention employed in class.

(b) Take a correctly encoded Hamming-(7,4) message and flip any two bits. What state is the message in when you then try to decode?

(5+5)

7. Consider the following router network:



Use Dijkstra's algorithm to compute the shortest path from router A to every other router in the network. (10)