

1. (40%, 2 points for each problem) Please define the following terms and explain the content, purpose, and application of each term and give an illustrative example if possible. If possible, define the term in mathematical equation. If it is an acronym, please write the full name. For example: SSD: Solid-State Drive: A solid-state drive (SSD) is a storage device that typically uses flash memory to store data, instructions, and information. Flash memory contains no moving parts, making it more durable and shock resistant than other types of media. SSDs offer higher input/output rates and lower latency, but are slightly more expensive for the same capacity. For this reason, manufacturers typically offer SSDs as an option instead of hard disks in their laptops, tablets, and desktops.

(1) Viterbi algorithm (2) CNN (3) TPU: Tensor Processing Unit (4) NumPy (5) min-max heap (6) AVL tree (Adelson-Velsky and Landis tree) (7) dynamic programming (8) RFID (9) Wi-Fi (10) IoT: Internet of Things (11) stack data structure (12) DDoS (13) hyper threading (14) USB (15) virtual memory (16) flash memory (17) Unicode (18) BIOS (19) IPv6 (20) semaphore

2. (6%) Please draw the binary tree for the expression “ $(B*(D+E))/(C-F)+ E*(A+F)$ ” and write prefix and postfix forms.

3. (6%) Please draw the binary search tree after successively inserting keys 8, 3, 1, 4, 9, 6, 7, 2, 5 into an initially empty tree.

4. (8%) Please write and draw at least four network topologies and explain advantages and disadvantages.

5. (6%) Please write decimal -23.875 in two’s complement.

6. (6%) Please write the recursive pseudo code `int Fibonacci(N)` to compute and print Fibonacci number: `Fibonacci(0)=0`, `Fibonacci(1)=1...`

7. (6%) Please calculate the GPU VRAM requirements for a Large Language Model (LLM) with 6 billion parameters using three different data formats: FP32, INT8, and INT4.

8. (8%) Please write the 7 phases of Software Systems Development Life Cycle (SDLC).

9. (6%) Please list at least 4 cloud platforms and services and explain differences, advantages, and disadvantages in detail.

10. (8%) Please explain steps of Kruskal’s algorithm finding a minimum spanning tree. Please draw the minimum spanning tree for the following graph.

