

School of Information Technology and Engineering (SITE)

Model Exam 1

Time allotted: 2 hours

Instructions

- Attempt all questions
- Any form of cheating will result in dismissal from the exam hall.

Fundamental of Networking

1. _____ refers to the amount of time, to include delays, for data to travel from one given point to another.
 - A. Speed
 - B. Bandwidth
 - C. Throughput
 - D. Goodput
 - E. None of the above
2. _____ is a standard organization that develops, updates, and maintains Internet and TCP/IP technologies.
 - A. ISOC
 - B. IAB
 - C. IETF
 - D. TRTF
 - E. None of the above
3. _____ software installed on a user device that secretly collects information about the user
 - A. Viruses,
 - B. worms
 - C. Trojan horses
 - D. None of the above
4. Which one of the following is not a Specific feature of WAN?
 - A. WANs interconnect end devices in a limited area such as a home, school, office building, or campus.
 - B. A WAN is usually administered by a single organization or individual.
 - C. WANs provide high-speed bandwidth to internal end devices and intermediary devices.
 - D. None of the above
 - E. None
5. _____ enables clients to retrieve email from a mail server.
 - A. Simple Message Transfer Protocol
 - B. Post Office Access Protocol version 3
 - C. Internet Mail Access Protocol
 - D. Email Message Transfer Protocol
 - E. None of the above
6. Which one of the following is not true about the role of intermediate network devices?
 - A. Make and encapsulate user data
 - B. It builds data-link layer address of remote networks
 - C. Permit and deny errors and failures
 - D. All
 - E. None
7. What is the prefix associated with the IPv6 address 2001:ACAD:DB8:AE:CD:CD::1/64?
 - A. 2001:ACAD:DB8:AE:CD:CD::/64

- B. 2001:ACAD:DB8:AE::/64
 - C. 2001:ACAD:DB8:AE:CD:CD::1
 - D. 2001:ACAD:DB8:AE:
 - E. None
8. What type of address is automatically assigned to an interface when IPv6 is enabled on that interface?
- A. Global Unicast
 - B. Multicast
 - C. Anycast
 - D. Unique-local
 - E. None
9. A network administrator is variably subnetting a network. The smallest subnet has a mask of 255.255.255.224. How many usable host addresses will this subnet provide?
- A. 32
 - B. 64
 - C. 128
 - D. 16
 - E. None
10. Which one of the following is not used for rules of engagement for message timing?
- A. Access method
 - B. Flow Control
 - C. Response Timeout
 - D. Encoding
 - E. None of the above

Machine Learning

11. Which of the following is NOT a core goal of machine learning?
- A. Enabling computers to learn without explicit programming.
 - B. Performing complex calculations efficiently.
 - C. Extracting insights and patterns from data.
 - D. Reasoning and making logical deductions.
12. In Bayesian decision theory, minimizing the expected _____ is the key objective when making decisions under uncertainty.
- A. cost
 - B. variance
 - C. bias
 - D. runtime
13. Which of the following assumptions is NOT typically made by parametric methods?
- A. The data distribution follows a known form (e.g., Gaussian).
 - B. The model parameters can be estimated from the data.
 - C. The model complexity can be adjusted based on the data.
 - D. Non-linear relationships can be modeled using transformations.
14. Principal Component Analysis (PCA) aims to achieve dimensionality reduction by finding the _____.
- A. data points with the highest variance
 - B. optimal hyperplane for classification
 - C. directions of maximum data spread

- D. features with the strongest correlations
15. K-means clustering assigns data points to clusters based on their _____ to the cluster centroids.
- A. distance
 - B. similarity
 - C. correlation
 - D. dependence
16. K-Nearest Neighbors (KNN) is an example of a nonparametric method because it:
- A. Makes strong assumptions about the underlying data distribution.
 - B. Relies on a fixed set of model parameters.
 - C. Learns directly from the training data without predefined assumptions.
 - D. Requires significant computational resources for training.
17. Decision trees classify data points by recursively splitting the data space based on _____ features.
- A. numerical
 - B. most relevant
 - C. most correlated
 - D. all available
18. In linear regression, the predicted value is a linear function of the _____.
- A. distance from the hyperplane
 - B. class probabilities
 - C. independent variables
 - D. dependent variable
19. What is the main advantage of using kernel methods in machine learning?
- A. They are faster than other machine learning algorithms for all tasks.
 - B. They allow linear algorithms to work effectively with non-linear data. (Correct)
 - C. They require less data for training compared to other methods.
 - D. They can only be used with Support Vector Machines (SVMs).
20. HMMs are useful for modeling sequential data where the underlying states are ____.
- A. always observable
 - B. partially observable
 - C. completely random
 - D. pre-defined

Fundamental of Database

21. If a relation schema is in 3NF and it is known to have just one candidate key,

- A. it cannot be in 2NF.
 - B. it must also be in BCNF.
 - C. it cannot be in BCNF.
 - D. it may be in BCNF or it may not be; there is not enough information to know.
22. Which of the following keywords/elements is NOT required in an SQL query?
- A. table name
 - B. from
 - C. select
 - D. where
23. An INNER JOIN returns rows of tables where the data _____
- A. is different
 - B. intersects
 - C. is read- only
 - D. is not null
24. How would you remove the following transitive dependency for the table Customer, with fields CustomerID, CustomerCity, and CustomerZipCode?
- A. create new table called customer location, add customerid as the primary key and add customercity as foreign key to the original customer table
 - B. create new table called customer2 and add all fields and join on customer id
 - C. create new table called customer location, add customerZipcode and customercity , in the original customer table customerZipcode is a foreign key to the new table
 - D. create new table called customerZipcode and add only the Zip code
25. Persistence is an object characteristic that denotes its _____.
- A. data
 - B. lifetime
 - C. class
 - D. method
26. _____ limits who gains access to the database while _____ limits what a user can access within the database.
- A. data access, user monitoring
 - B. access authentication , user definition
 - C. access authentication, view definition
 - D. access control , database security
27. You are designing a database schema and you are unsure how some of the tables will relate. What should you do?
- A. keep one table into which you can store all data
 - B. list out sample data to determine final layout
 - C. join tables together no matter the field types or data
 - D. leave as-is and begin data adding
28. in translating from an entity-relationship (E-R) diagram to a relational schema, one piece of E-R logic that cannot be captured by primary keys, unique, and foreign keys is
- A. the weak entity.
 - B. any ternary relationship.
 - C. mandatory participation for one-time occurrence (that is, with the arrow).
 - D. mandatory participation for many-time occurrence (that is, without the arrow).
 - E. aggregation.
29. Codd's rule of physical data independence is that
- A. all information in the database is to be represented in one and only one way, namely
 - B. by values in column positions within rows of tables.
 - C. all views that are theoretically updateable must be updateable by the system.
 - D. changes that are made to the physical storage representations or access methods
 - E. must not require changes be made to application programs.
 - F. changes that are made to tables that do not modify any of the data already stored in the tables must not require changes be made to application programs.

G. data in different tables must not be related

30. Which of the following operations does SQL allow you to perform?
- A. sorting
 - B. searching
 - C. storing
 - D. all

Operating Systems

31. What is time-sharing?
- A. CPU interrupting current process because of I/O
 - B. CPU time is shared among processes by using interrupt
 - C. CPU time is used by processes while they are running parallelly
 - D. CPU with multiple cores executing instructions of a single process parallelly
 - E. None
32. Context switching is required:
- A. When processes switch from one state to another state
 - B. When the CPU loads instructions from memory to MAR
 - C. When a process spawns threads
 - D. When the CPU interrupts current process and switch to another process
 - E. None
33. Consider a system with four page frames. Pages 1 2 0 5 4 2 3 0 4 2 0 3 have been referenced in order. If an **FIFO** page replacement algorithm is used, how many page faults will occur?
- A. 2
 - B. 3
 - C. 4
 - D. 5
 - E. None
34. Assume three processes, P0, P1, P2 are currently running with a strict alternation mutual exclusion algorithm. P0 is running in its critical section and will change the turn to P1. However, P1 is not interested in entering its critical region while P2 is waiting to enter the critical region. Which mutual exclusion principle is violated?
- A. A process, which is not in a critical region, should not block another process from entering critical region
 - B. No two processes should be in critical region at the same time
 - C. A process that is interested in entering its critical region should be allowed regardless of other processes.
 - D. Processes shouldn't be blocked from entering critical regions if the two processes are completely independent.
 - E. None
35. Which one of the following scheduling algorithms favors CPU-bound processes?
- A. First-Come First-Served
 - B. Shortest Job First
 - C. Shortest Remaining Time Next
 - D. Round Robin
 - E. None
36. Consider a computer with 24 bit addressing. What is the maximum address space supported by this computer?
- A. 4K
 - B. 128K
 - C. 16M
 - D. 64M

E. None

37. Which one of the following is the proper order in increasing size data storage?
- A. Track -> Sector -> Cylinder
 - B. Sector -> Cylinder -> Track
 - C. Track -> Cylinder -> Sector
 - D. Sector -> Track -> Cylinder
 - E. None
38. Which of the following conditions is necessary for a deadlock to occur in an operating system?
- A. Preemption of resources
 - B. Circular wait
 - C. Mutual exclusion
 - D. Livelock
 - E. None
39. Which one of the following is not a possible process state transition?
- A. Running \Rightarrow blocked
 - B. Blocked \Rightarrow Ready
 - C. Ready \Rightarrow blocked
 - D. Blocked \Rightarrow suspended
 - E. None
40. The normal instruction execution cycle is **Fetch \Rightarrow Decode \Rightarrow Execute**. At which stage will an interrupt be processed?
- A. Before decoding fetched instruction
 - B. Before fetching another instruction
 - C. Before Executing an instruction
 - D. It can be handled at any stage of the cycle
 - E. None

Data structures and Algorithm

41. What is the time complexity of linear search in an unsorted array with n elements?

pseudocode

```
LinearSearch(Array, target):  
    for each element in Array:  
        if element == target:  
            return True  
    return False
```

- A) $O(1)$
 - B) $O(\log n)$
 - C) $O(n)$
 - D) $O(n^2)$
42. Which data structure is typically employed to enforce Last-In-Last-Out (LILO) behavior?
- A) Queue
 - B) Linked List
 - C) Stack
 - D) Hash Table
43. What is the worst-case time complexity of searching for an element in a hash table with separate chaining collision resolution?

- A) $O(1)$
- B) $O(\log n)$
- C) $O(n)$
- D) $O(n^2)$

44. Among the listed sorting algorithms, which one exhibits the most favorable worst-case time complexity?
- A) Bubble Sort
 - B) Insertion Sort
 - C) Quick Sort
 - D) Merge Sort
45. Which data structure is typically used to implement recursion?
- A) Queue
 - B) Stack
 - C) Linked List
 - D) Array
46. What is the primary purpose of a hash function in hash table operations?
- A) To generate random keys
 - B) To evenly distribute elements across the table
 - C) To sort elements in ascending order
 - D) To compress the size of the hash table
47. Which of the following is not a common application of graphs?
- A) Social networks
 - B) Road maps
 - C) File systems
 - D) Sorting algorithms
48. Which among the listed algorithms operates on the principle of divide-and-conquer?
- A) Breadth-First Search (BFS)
 - B) Depth-First Search (DFS)
 - C) Quick Sort
 - D) Dijkstra's Algorithm
49. Which of the following statements concerning trees is inaccurate?
- A) A tree represents a hierarchical data structure.
 - B) A tree with n nodes encompasses $n-1$ edges.
 - C) A tree may exhibit multiple roots.
 - D) A tree can exist in an empty state.
50. Which of the following is an example of a greedy algorithm?
- A) Depth-First Search (DFS)
 - B) Dijkstra's algorithm
 - C) Prim's algorithm
 - D) Merge Sort

Fundamentals of AI

51. What is the main disadvantage of uninformed search algorithms?
- A) They are not complete
 - B) They are not optimal
 - C) They are not admissible
 - D) They are not consistent
52. What is the main advantage of informed search algorithms?
- A) They are complete
 - B) They are optimal
 - C) They are admissible
 - D) They are consistent
53. Which one of the following pair of algorithms has equal cost in terms of time and space complexity under equal success function cost?
- A) DFS and BFS
 - B) UCS and BFS

- C) DFS and UCS
- D) A* and BFS

54. What is the difference between Dijkstra's Algorithm and Uniform Cost Search (UCS)?

- A) Uniform Cost Search finds the optimal solution while Dijkstra's Algorithm
- B) Dijkstra's Algorithm is optimal, but not UCS
- C) Dijkstra's Algorithm discovers nodes as they come while UCS first collects them in a Queue
- D) Dijkstra's Algorithm first collects them into a Queue but UCS discovers them as they come

55. Which of the following statements is true about Artificial Intelligence (AI)?

- A) AI refers to the development of machines that can perform tasks that typically require human intelligence.
- B) AI refers to the development of machines that can only perform simple, repetitive tasks.
- C) AI refers to the development of machines that can only perform physical tasks.
- D) AI refers to the development of machines that can perform tasks only in a controlled laboratory setting.

56. What is the definition of artificial intelligence (AI)?

- A. The study of how computers can perform tasks that normally require human intelligence
- B. The creation of robots that can mimic human behavior
- C. The use of advanced algorithms to automate tasks in businesses
- D. The development of new programming languages to improve software performance

57. Which of the following is NOT one of the main types of AI?

- A. Artificial Neural Networks
- B. Expert Systems
- C. Genetic Algorithms
- D. Humanoid Robotics

58. What is supervised learning in AI?

- A. Training a machine learning model with labeled data
- B. Training a machine learning model with unlabeled data
- C. Reinforcing learning with a reward-based system
- D. Learning by observing human behavior

59. What is natural language processing (NLP) in AI?

- A. Teaching machines to understand and process human language
- B. Teaching machines to understand and process mathematical equations
- C. Teaching machines to understand and process visual data
- D. Teaching machines to understand and process audio data

60. What is the difference between narrow and general AI?

- A. Narrow AI can perform only specific tasks, while general AI can perform any task
- B. Narrow AI is based on machine learning, while general AI is based on deep learning
- C. Narrow AI can only perform tasks related to a specific industry, while general AI can perform tasks across multiple industries
- D. Narrow AI is controlled by humans, while general AI is autonomous