Q1: Choose the correct answer:

1. Purpose of an OS is
   a. Creates abstractions
   b. Multiple processes compete for use of processor
   c. Coordination
   d. all of above

2. Scheduler decides
   a. which processes get to use the processor
   b. when processes get to use the processor
   c. when and which processes get to use the processor
   d. no one of above

3. Virtual Memory allows processes to
   a. delete information stored on a storage device when deleted in primary memory.
   b. reference information stored on a storage device as if it were stored in primary memory.
   c. update information stored on a storage device when updated in primary memory.
   d. all of above

4. Direct Memory Access it’s a way to
   a. increase the CPU utilization.
   b. increase the Memory utilization.
   c. increase the I/O utilization.
   d. no one of above

5. Device Management is implemented across
   a. resource managers
b. device drivers

c. device handlers.

d. all of above

6. The modern OS uses
   a. multiprogramming, the illusion that applications each reside inside of their own computer.
   b. multiprocessor, the illusion that applications each reside inside of their own computer.
   c. multithreads, the illusion that applications each reside inside of their own computer.
   d. all of above

7. In a classic OS system,
   a. only one program can be running per processor, the base thread
   b. additional threads can share the host process’ resources
   c. only one thread can be running per processor, the base thread
   d. no one of above

Q2 Explain briefly, Steps in Thread Scheduling
1) A sequence of characters to be treated as a single unit.
   a) token b) white space c) lexemes d) statements

2) Parserscan the input from left to right and construct a right most derivation in reverse.
   a) LR b) bottom up c) top down d) predictive

3) are statements that generally produce no executable code.
   a) declaration statements b) control statements c) computation statements d) structure statements

4) The syntax directed translation scheme is useful because it enables the compiler designer to express the generation.
   a) intermediate code b) source code c) machine code d) syntactic code

5) If the source language is assembly language and the target language is machine language then the translator is called.
   a) assembler b) interpreter c) compiler d) code generator

6) A grammar that produce more than parse tree for same sentence is said to be.
   a) Ambiguous b) context free grammar c) normal form grammar d) syntactic grammar

7) Operator precedence parse is especially suitable for parsing.
   a) expression b) recursive routines c) associative operators d) all above

Q4 By example give the difference between top down parsing bottom up parsing.
Q5 Choose the correct answer:
1- If A square matrix, and A is invertible matrix. If $A^{-1}$ the inverse of A then..
   a) $A^{-1} = \frac{1}{A}$,   b) $AA^{-1} \neq I$,   c) $A^{-1}A = I$

2- $\frac{d}{dx} (\cot^{-1}(x))$ is … …………………… …
   a) $\frac{1}{1-x^2}$,   b) $\frac{-1}{1+x^2}$,   c) $\frac{1}{1+x^2}$

3- The solution of following differential equation $[y''-4y=0]$ is……
   a) $y = c_1 + c_2 e^{4x}$,   b) $y = c_1 + c_2 e^{-4x}$,   c) $y = c_1 e^{2x} + c_2 e^{-2x}$

4- The solution of following differential equation $[y'' = 0]$ is……
   a) $y = c_1 + c_2 e^x$,   b) $y = c_1 + c_2$,   c) $y = c_1 + xc_2$

5- If $[f(t) = \sinh 2t]$, the Laplace transformation $[f(s) = L \{\sinh 2t\}]$, is……
   a) $f(s) = \frac{1}{s^2 - 4}$,   b) $f(s) = \frac{2}{s^2 - 4}$,   c) $f(s) = \frac{2}{s^2 + 4}$

6- If $[f(s) = \frac{4}{s^5}]$, the inverse of Laplace transformation $[f(t) = L^{-1}(\frac{4}{s^5})]$ is……
   a) $f(t) = t^4$,   b) $f(t) = 24t^4$,   c) $f(t) = \frac{t^4}{6}$

7- If $f(x, y)$ and its partial derivatives $f_x, f_y, f_{yx},$ and $f_{xy}$ are define in region containing a point (a, b) and are all continuous at (a, b), then ………
   (a) $f_{xx} = f_{yy}$, (b) $f_{yx} = f_{xy}$, (c) $f_{yx} \neq f_{xy}$.

Q6 Find cosine Half-range series for the function defined as $f(x) = 4$, for $0 < x < \pi$. 
Q7 Choose the correct answer:

1 - Which of the following registers is used to keep track of address of the memory location where the next instruction is located?
   a. Memory Address Register  
   b. Memory Data Register  
   c. Instruction Register  
   d. Program Register

2 - Pipelining strategy is called implement
   a. instruction execution  
   b. instruction prefetch  
   c. instruction decoding  
   d. instruction manipulation

3 - IRR stands for:
   a. Interrupt request register  
   b. Input request register  
   c. Interrupt resolver register  
   d. Input resolver register

4 - A stack pointer is
   a. a 16-bit register in the microprocessor that indicate the beginning of the stack memory.  
   b. a register that decodes and executes 16-bit arithmetic expression.  
   c. The first memory location where a subroutine address is stored.  
   d. a register in which flag bits are stored

5 - The branch logic that provides decision making capabilities in the control unit is known as
   a. controlled transfer  
   b. conditional transfer  
   c. unconditional transfer  
   d. none of above

6 - Interrupts which are initiated by an instruction are
   a. internal  
   b. external  
   c. hardware  
   d. software
7 - A time sharing system imply
a. more than one processor in the system
b. more than one program in memory
c. more than one memory in the system
d. None of above

8 - Which is a type of microprocessor that is designed with limited number of instructions:

a. CPU
b. RISC
c. ALU
d. MUX

Q8 What is cache?
Q9: Choose the correct answer:

1. In the linked list implementation of the stack, the push method places the new entry on the linked list__________.
   A. At the tail
   B. At the head
   C. At the middle.
   D. At any of the above answers.

2. Considering the linked-list LIST, and the functions addAfter and addBefore that add a node after(before) a node with a specific data value:

   ![Diagram of linked list](image)

   Which operations are constant time operations in the worst case?
   A. addAfter is constant time, but not addBefore
   B. addBefore is constant time, but not addAfter
   C. Both addAfter and addBefore are constant time
   D. Neither addAfter nor addBefore are constant time.

3. A linked list implemented queue, keeping track of a front node and a rear node with two reference variables. Which of these reference variables will change during an insertion into an EMPTY queue?
   A. Neither changes
   B. Both change.
   C. Only front changes.
   D. Only rear changes.

4. The recursive version in compare to iteration version is usually__________
   A. Slower and uses more memory
   B. Faster and uses more memory.
   C. Slower and uses less memory.
   D. Faster and uses less memory.

5. Which of the following applications may use a stack?
   A. A parentheses balancing program.
   B. Keeping track of local variables at run time.
   C. Syntax analyzer for a compiler.
   D. All of the above.
6. What is the worst-case time for insert algorithm to sort an array of N elements?
   A. O(log N)
   B. O(N)
   C. O(N²)
   D. O(2ᴺ)

7. The general strategy to remove a node with two children in a binary search tree is to:
   A. Replace the data of this node with the smallest data of the right subtree.
   B. Replace the data of this node with the largest data of the right subtree.
   C. Replace the data of this node with the smallest data of the left subtree.
   D. Replace the data of this node with the largest data of the left subtree.

8. The depth of the node nᵢ in a tree is:
   A. The length of the longest path from the root to a leaf connected to nᵢ.
   B. The longest path from nᵢ to a leaf.
   C. The length of the unique path from the root to nᵢ.
   D. The path from nᵢ to its ancestor.

Q10 Define Divide and conquer strategy. What is the technique to implement this strategy? Mention to algorithms that are based on divide and conquer strategy.
Q11: Choose the correct answer:

1- One of the following is not DB Model?
   a) Relational Data Model c) Object Data Model
   b) Security Data Model d) Network Data Model

2- SQL has 2 class of data processing _____ and _______
   a) DNL & HAL c) DDL & DML
   b) DML & HDL d) DDL & DHL

3- __________ is known as a Cartesian product, in practical terms it is a
   join without a join condition.
   a) Cross Join c) Full Outer Join
   b) Inner Join d) Full Inner Join

4- __________ describe what data are stored in the database and what
   relationship exist among those data.
   a) Physical Level c) Logical Level
   b) User Level d) View Level

5- In ________, a table that has a concatenated primary key, each column
   in the table that is not part of the primary key must depend upon the
   entire concatenated key for its existence.
   a) Third Normal Form c) First Normal Form
   b) Second Normal Form d) General Normal Form

6- The events in an entity is described in an ____________
   a) Strong Entity c) Entity Life History
   b) Weak Entity d) Entity Life Cycle

7- __________ an index entry appears for every search key value in the
   file.
   a) Secondary index c) Sparse index
   b) Dense index d) Hash index

Q12 What are the advantages of DBMS?
Q13: Choose the correct answer:

1. ____________ are programs that claim to perform a particular function but in fact do something different, e.g. at first glance will appear to be useful software but will actually do damage once installed or run on your computer.
   a) Trojan Horses viruses  b) File viruses  c) Macro viruses  d) Worm viruses.

2. __________ is a security attack that allows an adversary to observe and modify all web pages sent to the victim's machine, and observe all information entered into forms by the victim.
   a) Web Mining  b) Web Spoofing  c) Web Integrity d) Web Design

3. A digital signature of an arbitrary document is typically created by computing a ________ from the document, and concatenating it with information about the signer, a timestamp, etc.
   a) Message features  b) Message compression  c) Message digest  d) Message analysis

4. The __________ is a very specific case of a substitution cipher where the letters of the alphabet are reversed
   a) Polygraphic cipher  b) Double Column Transposition cipher  c) Columnar Transposition cipher  d) Atbash cipher

5. Which of the following statement is true?
   a) DES is a widely used symmetric block cipher. It encrypts 64-bit data, and uses 56-bit key.
   b) DES is a widely used symmetric block cipher. It encrypts 64-bit data, and uses 56-bit key.
   c) DES is a widely used symmetric block cipher. It encrypts 46-bit data, and uses 56-bit key.
   d) DES is a widely used symmetric block cipher. It encrypts 64-bit data, and uses 65-bit key.

6. __________ An attack in which a secret value like a hash is captured and then reused at a later time to gain access to a system.
   a) Brute-force attack  b) Replay attack  c) Password Hashing  d) Chosen-plaintext attack.
7. Which of the following statement is true?
   a) Public-Key Cryptography is symmetric, since parties are equal
   b) Public-Key Cryptography it is computationally hard to en/decrypt messages when the relevant (en/decrypt) key is known
   c) Public-Key Cryptography is asymmetric because those who encrypt messages or verify signatures cannot decrypt messages or create signatures
   d) Public-Key Cryptography is a /two-key/asymmetric cryptography involves the use of one keys.

8. __________ has been defined by the International Organization for Standardization (ISO) as "ensuring that information is accessible only to those authorized to have access" and is one of the cornerstones of Information security.
   a) Non-repudiation b) Integrity c) Authentication d) Confidentiality

Q14 What is the difference between symmetric and asymmetric Encryption algorithms? Which one is the most secure and why?
Q15  Choose the correct answer from the following:

1. The suitable control strategy that is preferred to implement the classification system is ............... 
   a. Forward chaining 
   b. Backward chaining 
   c. Rule Cycle 
   d. Sequential process 

2. One of the following components is distinguished the expert system from other intelligent systems.
   a. Working Memory 
   b. Explanation Mechanism 
   c. User Interface 
   d. Knowledge Base 

3. The ................. algorithm has two functions in its procedure to solve problems.
   a. Best First search 
   b. Hill Climbing 
   c. Breadth First search 
   d. A* 

4. The prolog language is recognized from other A.I languages in ................. 
   a. List processing 
   b. Variable types 
   c. Built in functions 
   d. String processing 

5. The following Artificial Neural Networks have some type of memory storage 
   a. Hopfield 
   b. Kohonen 
   c. BAM 
   d. Back Propagation 
   e. Adaline 

6. In Genetic Algorithms the crossover is an operation of: 
   a. Combining genetic information. 
   b. Adding new genetic information to the new population. 
   c. Appending two chromosomes to form new chromosomes. 
   d. Changing the allele of some gens.
e. Selecting the strong parents with strong children.

7. The ...................... is an improved knowledge representation method.
   a. Predicate Logic
   b. Semantic Network
   c. Frames
   d. Conceptual Graph

8. Which of the following search algorithms is specified to solve Games?
   a. Depth First search
   b. Best First search
   c. Alpha Beta
   d. Tabu Search
   e. MinMax

**Q16** Compare between Heuristic Search and Blind Search in terms of run time, memory capacity, and efficiency.