Examination: **Ph.D Computer Science and Engineering**

SECTION 1 - SECTION 1

Question No.1

Which of the following protocol is used to secure a VPN connection?

- IPSec
- L2TP
- SSL
- TLS

Question No.2

Each printf statement prints 2 addresses. Select the line in which 2 addresses are same.

```
#include<stdio.h>
int main()
{
 int a[6]={1,2,3,4,5,6};
 printf("%ul,%ul,",a,&a);   //Line 1
 printf("%ul,%ul,",a+1,&a+1); //Line 2
 printf("%ul,%ul",a+6,&a+1);//Line 3
}
```

- Line 1 & Line 3
- Only line 2
- Only line 1
- Line 1 & Line 2

Question No.3

The minimum number of comparisons required to find the minimum and the maximum of 100 numbers is

- 198
- 147
- 100
- 99

Question No.4

In the process table entry for the kernel process, the process id value is

- 0
- 1
- 255
- it does not have a process table entry

Question No.5

The complexity of merge sort algorithm is

- O(n)
- O(n log n)
- O(log n)
- $O(n^2)$

Question No.6

Which of the following facts about reinforcement learnings are TRUE?
I. Either Supervisory or Unsupervisory learning
II. Neither Supervisory nor Unsupervisory learning
III. Can be modeled as Markov decision process
IV. Can be modeled as Hidden Markov decision process

- Either I or IV
- Both I and IV
- Either II or III
- Both II and III

Question No.7

The maximum number of edges in a bipartite graph on 12 vertices is

- 12
- 24

- 36
- 48

Question No.8

An accurate and efficient raster line-generating algorithm is _____.

- DDA algorithm
- Mid-point algorithm
- Bresenham's line algorithm
- Parallel line algorithm

Question No.9

For the processes listed in the following table, which of the following scheduling schemes will give the lowest average turnaround time?

Process	P1	P2	P3	P4
Arrival Time	0	1	4	6
Execution Time	3	6	4	2

- First Come First Serve
- Shortest Remaining Time
- Non- pre emptive Shortest Job First
- Round Robin with Quantum value two

Question No.10

The total number of passes required in a selection sort is

- n-1
- n × n
- n
- n+1

Question No.11

Which of the following techniques are useful for prediction?

- Gaussian Mixture model
- Linear Regression
- Support Vector Machine
- Logistic Regression

Question No.12

What is the algorithm to handle collisions in ethernet networks?

- Collision Pooling
- ARP
- Time Division Mux
- exponential-backoff

Question No.13

The maximum number of super keys for the relation schema R (A, B, C, D) with A as the key is

- 5
- 8
- 10
- 9

Question No.14

Which of the following data structure is not linear?

- Arrays
- Linked lists
- Both Arrays and Linked lists
- None of these

Question No.15

A program containing 50% of floating point arithmetic completes in 100 cycles in a certain processor. The processor is replaced by a faster processor that executes floating point arithmetic 5 times faster. What is the overall speedup by the new processor?

- 1.3

- 1.9
- 1.5
- 1.7

Question No.16

Distance Vector Routing uses _____ to determine distances to its own neighbors.

- incoming vectors
- leaky bucket
- ping
- outgoing packets

Question No.17

Consider the matrix

$$\begin{matrix} 1 & 2 & 3 \\ 0 & 4 & 7 \\ 0 & 0 & 3 \end{matrix}$$

Which one of the following options provides the correct values of the Eigenvalues of the matrix?

- 1,2,3
- 2,7,3
- 3,7,3
- 1,4,3

Question No.18

_____ shows the dependencies between activities, the estimated time required to reach each milestone and the allocation of people activities.

- Reporting Mechanisms
- Project Schedule
- Risk Analysis
- Project Organization

Question No.19

The minimum number of edges in a connected cycle graph on n vertices is

- n
- n-1
- n+1
- n * n

Question No.20

Zero has two representation in:

- Sign magnitude
- 1's Complement
- 2's Complement
- None of these

Question No.21

What is the minimum number of NAND gates required to implement a 2-input EXCLUSIVE-OR function without using any other logic gate ?

- 6
- 3
- 5
- 4

Question No.22

What is a trigger

- A piece of logic written in PL/SQL
- Executed at the arrival of a SQL*FORMS event
- Both A piece of logic written in PL/SQL and Executed at the arrival of a SQL*FORMS event
- None of these

Question No.23

Poor response times are usually caused by

- Process busy
- High I/O rates
- High paging rates
- Any of these

Question No.24

What is the name of the fixed route established at the time of initial connection setup in ATM networks?

- passage
- VPN
- virtual circuit
- connection network

Question No.25

Assume that a set of n distinct elements are given with an unlabeled binary tree of n nodes. In how many ways the tree can be populated with the given set so that it becomes a binary search tree?

- 0
- 1
- 1/(n+1)
- !n

Question No.26

Consider the following list of properties:
1. Write buffering
2. Write serialization
3. Write propagation
4. Write reflection

A good cache coherence protocol should exhibit:

- 1, 2, 3
- 2, 3, 4
- 1, 2, 3, 4
- 3, 4

Question No.27

“Model selection” in machine learning refers to

- Selection of Suitable mathematical model
- Selection of Degree of polynomial
- Selection of Objective function
- Selection of Type of learning

Question No.28

Which of the following is true

- SQL is not a DML but it is a DDL
- SQL is neither a DDL nor a DML
- SQL is not a DDL but it is a DML
- SQL is both a DDL and DML.

Question No.29

Which one of the following socket API functions converts an unconnected active TCP socket into a passive socket?

- Connect
- Listen
- Accept
- Bind

Question No.30

What is the purpose of a test case specification in software engineering?

- To specify inputs, predicted results, and a set of execution conditions for a test item
- To list the test procedures to be performed on the integration of the software with hardware
- To list the specific tests to be conducted on the integration of each software module with other modules
- To specify the sequence of actions for the execution of a test

Question No.31

The postfix of A+(B*C)is

- ABC*+
- +A*BC
- AB+C*
- ABC+*

Question No.32

Swapping.

- Works best with many small partitions
- Does not work with overlaying
- Allows each program in turn to use the memory
- Allows many programs to use memory simultaneously

Question No.33

In a graph, a path that traverses all the edges of the graph exactly once is called:

- Newtonian Path
- Djikstra's Path
- Hamiltonian Path
- Eulerian Path

Question No.34

A full binary tree with n leaves contains_____

- n nodes
- nlogn nodes
- (2n-1) nodes
- 2^n nodes

Question No.35

How many different trees are possible with 10 nodes?

- 1024
- 1014
- 1240
- 1204

Question No.36

The complexity of merge sort algorithm is

- O(n log n)
- $O(n^2)$
- O(n)
- O(log n)

Question No.37

Consider a non-pipelined processor with a clock rate of 2.5 gigahertz and average cycles per instruction of four. The same processor is upgraded to a pipelined processor with five stages; but due to the internal pipeline delay, the clock speed is reduced to 2 gigahertz. Assume that there are no stalls in the pipeline. The speed up achieved in this pipelined processor is_____.

- 3
- 3.2
- 4.2
- 4

Question No.38

For 1 MB memory, the number of address lines required,

- 24
- 16
- 22
- 11

Question No.39

Consider a main memory system that consists of 8 memory modules attached to the system bus, which is one word wide. When a write request is made, the bus is occupied for 100 nanoseconds (ns) by the data, address, and control signals. During the same 100 ns, and for 500 ns thereafter, the addressed memory module executes one cycle accepting and storing the data. The (internal) operation of different memory

modules may overlap in time, but only one request can be on the bus at any time. The maximum number of stores (of one word each) that can be initiated in 1 millisecond is

- 5000
- 7000
- 10000
- 8000

Question No.40

The minimum number of arithmetic operations required to evaluate the polynomial $P(x) = x^5 + 4x^3 + 6x + 5$ for a given value of x using only one temporary variable.

- 8
- 7
- 9
- 6

Question No.41

Data independence means

- data is defined separately and not included in programs
- programs are not dependent on the physical attributes of data
- programs are not dependent on the logical attributes of data
- both programs are not dependent on the physical attributes of data and programs are not dependent on the logical attributes of data

Question No.42

Two main measures for the efficiency of an algorithm are

- Processor and memory
- Complexity and capacity
- Data and space
- Time and space

Question No.43

The result of evaluating the postfix expression 105 + 606 / * 8 – is

- 71
- 284
- 142
- 213

Question No.44

Memory allocation of variables declared in a program is

- allocated in ROM
- assigned to registers
- allocated in RAM
- allocated on stack

Question No.45

The model which reduces the cost of development of software is

- waterfall model
- prototyping
- iterative
- All of these

Question No.46

Consider the following grammar G

S -> F | H
F-> p | c
H -> d |c

Where, S,F, and H are non-terminal symbols, p, d, and care terminal symbols. Which of the following statement (s) is / are correct?

S1. LL(1) can parse al strings that are generated using grammar G
S2. LR(1) can parse all strings that are generated using grammar G

- Neither S1 nor S2
- Both S1 and S2
- Only S1

- Either S1 or S2

Question No.47

Given the function F = P' + QR, where F is a function in three Boolean variables P, Q and R and P' =! P, consider the following statements. (S1) F=∑ (4, 5, 6) (S2)F=∑ (0, 1, 2, 3, 7) (S3)F=∏ (4, 5, 6) (S4)F=∏ (0, 1, 2, 3, 7) Which of the following is true?

- (S1)-False, (S2)-False, (S3)-True, (S4)-True
- (S1)-True, (S2)-False, (S3)-False, (S4)-True
- (S1)-False, (S2)-True, (S3)-True, (S4)-False
- (S1)-True, (S2)-True, (S3)-False, (S4)- False

Question No.48

Which of the following is an advantage of view?

- Data security
- Derived columns
- Hiding of complex queries
- All of these

Question No.49

Piggy backing is a technique for

- Sequence
- retransmission
- Flow control
- Acknowledgement

Question No.50

What is garbage collection in the context of Java?

- When all references to an object are gone, the memory used by the object is automatically reclaimed.
- The JVM checks the output of any Java program and deletes anything that doesn't make sense.
- Any package imported in a program and not used is automatically deleted.
- The operating system periodically deletes all of the java files available on the system.

Question No.51

An operating system contains 3 user processes each requiring 2 units of resource R. The minimum number of units of R such that no deadlock will ever occur is:

- 5
- 6
- 3
- 4

Question No.52

Suppose P, Q, R, S, T are sorted sequences having lengths 20, 24, 30, 35, 50 respectively. They are to be merged into a single sequence by merging together two sequences at a time. The number of comparisons that will be needed in the worst case by the optimal algorithm for doing this is

- 458
- 258
- 452
- 358

Question No.53

If every node u in Graph (G) is adjacent to every other node v in G, it is called as

- Complete Graph
- Multi Graph
- Directed Graph
- Connected Graph

Question No.54

Which is not the state of the process ?

- Blocked
- Privileged
- Ready
- Running

Question No.55

There are 8,15,13,14 nodes in 4 different trees, respectively.Which of them could form a full binary tree?

- 13
- 15
- 14
- 8

Question No.56

Disk access takes of the order of

- x microsecs
- x millisecs
- x/100 secs
- x nanosecs

Question No.57

Consider the following statements.
I. TCP connections are full duplex
II. TCP has no option for selective acknowledgement
III. TCP connections are message streams

- Only I is correct
- Only I and III are correct
- Only II and III are correct
- All of I, II and III are correct

Question No.58

Whether Linked List is linear or Non-linear data structure?

- Non- Linear data structure
- Linear data structure
- Cyclic data structure
- According to Access strategies Linked list is a linear one and According to Storage Linked List is a Non-linear one

Question No.59

In functional classification of CASE tools, PERT tools, estimation tools, spread sheets are the examples of _____.

- planning tools
- change management tools
- configuration tools
- editing tools

Question No.60

What is a formal method?

- Used to refer to any activities that rely on mathematical representation of software including formal system specification
- Software specification where vocabulary, syntax and semantics are formally designed
- Process of developing a validating a product design
- Software engineering methods used to improve the software quality

Question No.61

Transferring the Process to another CPU requires to save state of the old process and loading new process state is called as

- Process Blocking
- Context Switch
- Time Sharing
- None of these

Question No.62

The operation of processing each element in the list is known as

- Merging
- Sorting
- Traversal
- Inserting

Question No.63

Which of the following statement is false?

- arrays are dense lists and static data structure
- linked lists are collection of the nodes that contain information part and next pointer
- pointers store the next data element of a list
- data elements in linked list need not be stored in adjacent space in memory

Question No.64

In a Hierarchical model records are organized as

- Links
- Graph
- Tree
- List

Question No.65

Assume that 4 processes are run on a single processor using preemptive Shortest Remaining Time Next scheduling algorithm with the arrival & CPU burst times, as given below. What is the burst time of P4 if the average waiting time of the process is 1 millisecond?

Process	P1	P2	P3	P4
Arrival Time	0	1	3	4
CPU burst Time	3	1	3	?

- 1
- 2
- 4
- 3

Question No.66

Which of the following project phases do Not require the involvement of end users?
1. Requirement analysis
2. Design
3. Hardware/Software configuration
4. Programming
5. User Acceptance Testing

- 2,3.5
- 1,3,5
- 1,4,5
- 2,3,4

Question No.67

Let the page fault service time be 10 ms in a computer with average memory access time being 20 ns. If one page fault is generated for every 106 memory accesses, what is the effective access time for the memory?

- 21 ns
- 30 ns
- 35 ns
- 23 ns

Question No.68

What is the maximum number of nodes possible in a heap of height h ? (Assume the height of the root node is 0).

- $2^{(h-1)}-1$
- $2^{h}-1$
- $2^{(h-n)}-1$
- $2^{(h+1)}-1$

Question No.69

The number of interchanges required to sort 5, 1, 6, 2, 4 in ascending order using Bubble sort is

- 8
- 6
- 5
- 7

Question No.70

Which of the following statements are NOT true about system analysis?
1. It is a detailed study of the existing programs

2. It helps in understanding the complexity of the existing system
3. It helps in understanding the relationship between the subsystems and the main system
4. It helps in deciding the programming language to be used for developing the system

- 2 and 3
- 2 and 5
- 1 and 5
- 3 and 4

Question No.71

A subnet mask in Class A has fourteen 1's. How many subnet does it define ?

- 32
- 64
- 16
- 08

Question No.72

Given an IP address 156.233.42.56 with a subnet mask of 7 bit. How many hosts and subnets are possible ?

- 512 hosts and 128 subnets
- 128 hosts and 512 subnets
- 126 hosts and 510 subnets
- 510 hosts and 126 subnets

Question No.73

Minimum number of D flip flops required to design mod-514 counter is

- 1024
- 10
- 514
- 9

Question No.74

Which of the following sorting methods would be most suitable for sorting a list which is almost sorted

- Selection Sort
- Insertion Sort
- Bubble Sort
- Quick Sort

Question No.75

Which one of the following correctly determines the solution of the recurrence relation
$T(n) = 2T(n/2) + \log(n)$ with $T(1) = 1$?

- $\theta(n \log n)$
- $\theta(\log n)$
- $\theta(n)$
- $\theta(n^2)$

Question No.76

Consider a snippet of code to calculate the sum of elements in a one dimensional array. The loop exhibits:

- Spatial Locality of Reference only
- Temporal Locality of Reference only
- Spatial and temporal Locality of Reference
- Neither spatial nor temporal Locality of Reference

Question No.77

Suppose that a computer has 32K storage locations. Exactly how many storage locations are there?

- 3768
- 32000
- 32768
- 32700

Question No.78

There are 8,15,13,14 nodes in 4 different trees. Which of them could form a full binary tree?

- 15
- 14
- 8
- 13

Question No.79

Which of the following data structure cannot store the non-homogeneous data elements?

- Arrays
- Records
- Pointers
- None of these

Question No.80

Datagrams using header extension are called _____

- payload
- datagram packets
- jumbograms
- trailer

Question No.81

To deliver a message to the correct application program running on a host, the _____ address must be consulted.

- tunnel
- port
- IP
- physical

Question No.82

Which memory technology consumes the smallest area to store a bit?

- HARD DISK
- Blue Ray Disk
- SDRAM
- DRAM

Question No.83

A 4-way set-associative cache memory unit with a capacity of 16 KB is built using a block size of 8 words. The word length is 32 bits. The size of the physical address space is 4 GB. The number of bits for the TAG field is

- 50
- 30
- 40
- 20

Question No.84

The average number of key comparisons done in a successful sequential search in list of length n is

- n/2
- log n
- (n-1)/2
- (n+1)/2

Question No.85

You have an array of n elements. Suppose you implement quicksort by always choosing the central element of the array as the pivot. Then the tightest upper bound for the worst case performance is

- $O(n^3)$
- $\Theta(nLogn)$
- O(nLogn)
- $O(n^2)$

Question No.86

Two hosts are connected via a packet switch with 107 bits per second links. Each link has a propagation delay of 20 microseconds. The switch begins forwarding a packet 35 microseconds after it receives the same. If 10000 bits of data are to be transmitted between the two hosts using a

packet size of 5000 bits, the time elapsed between the transmission of the first bit of data and the reception of the last bit of the data in micro seconds is

- 1657
- 1325
- 3467
- 1575

Question No.87

Let L_1={w∈{0,1} *| w has at least as many occurrences of (110)'s as (011)'s}.
Let L_2= {w ∈{0,1} *| w has at least as many occurrences of (000)'s as (111)'s}.
Which one of the following is TRUE?

- L2 is regular but not L1
- L1 is regular but not L2
- Neither L1 nor L2 are regular
- Both L1 and L2 are regular

Question No.88

Virtual memory is

- An extremely large secondary memory
- A type of memory used in super computers
- An extremely large main memory
- An illusion of extremely large main memory

Question No.89

$(1217)_8$ is equivalent to

- $(028F)_{16}$
- $(0B17)_{16}$
- $(1217)_{16}$
- $(2297)_{10}$

Question No.90

The minimum number of 8 port switches needed to connect 15 machines to be connected in a LAN is

- 1
- 3
- 2
- 4

Question No.91

Suppose Xi for i=1,2,3 are independent and identically distributed random variables whose probability mass functions are Pr[Xi=0]= Pr[Xi = 1]=1/2 for i=1,2,3. Define another random variable Y =X1X2⊕ X3, where ⊕ denotes XOR. Then Pr[Y=0|X3=0] is equal to

- 0.98
- 1
- 0.65
- 0.75

Question No.92

Which of the following involves context switch,

- System call
- Privileged instruction
- Floating point exception
- All of these

Question No.93

Sorting is not possible by using which of the following methods

- Deletion
- Exchange
- Insertion
- Selection

Question No.94

If two fair coins are flipped and at least one of the outcomes is known to be head, what is the probability that both outcomes are heads?

- 1/3
- 2/3
- 1/4
- 1/2

Question No.95

How many page faults occur in LRU page replacement algorithm for the following reference string, with four page frames?
7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1

- 8
- 6
- 9
- 7

Question No.96

_____is a process of determining if a string of tokens can be generated by a grammer.

- Phasing
- Parsing
- Translation
- Systemization

Question No.97

Consider the following program segment:

```
j=2;
while(i%j)
j=j+1;
if(j<i) cout<<j;
```

For a given i>=2, this program segment print j only if:-

- j is a prime
- i is not a prime
- j is odd
- j does not divide i

Question No.98

Problems encountered in IP networks are usually reported with this protocol.

- TCP
- SMTP
- ICMP
- HTTP

Question No.99

Consider a machine with a byte addressable main memory of 220 bytes, block size of 16 bytes and a direct mapped cache having 212 cache lines. Let the addresses of two consecutive bytes in main memory be (E201F)16 and (E2020)16. What are the tag and cache line address (in hex) for main memory address (E201F)16?

- E, E20
- F, 201
- E, 201
- 2, 01F

Question No.100

Which layer is responsible for flow control with sliding windows and reliability with sequence numbers and acknowledgments?

- Transport
- Network Interface
- Application
- Internet