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BATHINDA

Ph.D. Entrance Exam for COMPUTER APPLICATIONS

1. A database of research articles in a journal uses the following schema.
(VOLUME, NUMBER, STARTPAGE, ENDPAGE, TITLE, YEAR, PRICE)
The primary key is
(VOLUME, NUMBER, STARTPAGE, ENDPAGE) and the following functional dependencies exist in the schema.
(VOLUME, NUMBER, STARTPAGE, ENDPAGE) → TITLE
(VOLUME, NUMBER) → YEAR
(VOLUME, NUMBER, STARTPAGE, ENDPAGE) → PRICE
The database is redesigned to use the following schemas.
(VOLUME, NUMBER, STARTPAGE, ENDPAGE, TITLE, PRICE)
(VOLUME, NUMBER, YEAR)
Which is the weakest normal form that the new database satisfies, but the old one does not?
 - a) 1NF
 - b) 2NF
 - c) 3NF
 - d) BCNF
2. The drawback of building a large memory with DRAM is _____
 - a) The Slow speed of operation
 - b) The large cost factors
 - c) The inefficient memory organization
 - d) All of the mentioned
3. In a memory-mapped I/O system, which of the following will not be there?
 - a) LDA
 - b) IN
 - c) OUT
 - d) ADD
4. The IA-32 system follows which of the following design?
 - a) CISC
 - b) SIMD
 - c) RISC
 - d) ARM
5. What is the primary difference between a monolithic and a microkernel operating system?
 - a) Monolithic systems have a single, large kernel, while microkernel systems have a small kernel with additional user-space components
 - b) Microkernel systems are more secure and stable than monolithic systems
 - c) Monolithic systems are more efficient than microkernel systems
 - d) Microkernel systems are more flexible and scalable than monolithic systems
6. What is the purpose of a system call in an operating system?
 - a) To provide a way for user-level programs to request services from the operating system kernel
 - b) To encrypt and decrypt data on storage devices
 - c) To manage network connections
 - d) To provide a virtual memory system

7. What is the main difference between a GET and a POST request in HTTP?
- GET requests are used to retrieve data from the server, while POST requests are used to submit data to the server
 - GET requests are more secure than POST requests
 - POST requests are faster than GET requests
 - GET requests are more reliable than POST requests

8. The output of the following code will be?

```
#include <stdio.h>
int main ()
{
    int arr [5] = {510,240,330,410,520};
    printf ("%d", arr [5]);
    return 0;
}
```

- 520
 - 420
 - 0
 - Garbage value
9. What is the maximum number of edges in a bipartite graph having 16 vertices?
- 24
 - 64
 - 56
 - 48
10. Postfix form of following expression.

$(\alpha + (\beta * \gamma) / \delta) \% \epsilon$

- $\beta * \gamma / \delta + \alpha \% \epsilon$
- $\beta + \gamma * \delta \% \epsilon / \alpha$
- $\alpha + \beta / \gamma * \delta \% \epsilon$
- $\alpha + \beta * \gamma / \delta \% \epsilon$

11. We have the given values (1322, 2332, 2471, 5679, 2989, 5171, 7173, 9129) and the hash function $x \bmod 10$, which of the following lines below are correct?

- 2989, 5679, 9129 hashes to the same value
 - 1322, 2332 hash to the same value
 - All elements hash to the same value
 - 2471, 5171 has same hash value
- I, II and III
 - I, II
 - I, III and IV
 - III or IV

12. What would be the output after performing the following operations in a Deque?

```
insertfront(12);
insertfront(24);
insertrear(34);
insertrear(47);
deletefront();
insertfront(66);
insertfront(16);
deleterear();
show();
```

- 16, 66, 12, 34
- 66, 12, 34
- 47, 12, 34, 16
- 66, 16, 12, 34

13. Consider the following definition in c programming language

```
struct node
{
int data;
struct node * next;
}
typedef struct node NODE;
NODE *ptr;
```

Which of the following c code is used to create new node?

- a) ptr=(NODE*)malloc(sizeof(NODE));
- b) ptr=(NODE*)malloc(NODE);
- c) ptr=(NODE*)malloc(sizeof(NODE*));
- d) ptr=(NODE)malloc(sizeof(NODE));

14. In the following C++ code, let $n \geq m$.

```
int gcd(int n, int m) {
    if (n%m == 0) return m;
    if (n < m) swap(n, m);
    while (m > 0) {
        n = n%m;
        swap(n, m);
    }
    return n;
}
```

What is the time complexity of the above function assuming $n > m$?

- a) $\Omega(n)$
- b) $O(\log \log n)$
- c) $\Theta(\sqrt{n})$
- d) $\Theta(\log n)$

15. What does the following code will perform?

```
public void funct(Node node)
{
    if(size == 0)
        head = node;
    else
    {
        Node temp, curr_node;
        for(curr_node = head; (temp = curr_node.getNext()) != null; curr_node = temp);
        curr_node.setNext(node);
    }
    size++;
}
```

- a) Inserting a node at the starting of the list
- b) Inserting a node at the end of the list
- c) Deleting a node from the beginning of the list
- d) Deleting a node from the end of the list

16. What is the correct code from the following to find the minimum element in a binary search tree?

```
a) public void min(Tree root)
{
    while(root.left() != null)
    {
        root = root.left();
    }
    System.out.println(root.data());
}
```

```

b) public void min(Tree root)
    {
        while(root != null)
        {
            root = root.left();
        }
        System.out.println(root.data());
    }

c) public void min(Tree root)
    {
        while(root.right() != null)
        {
            root = root.right();
        }
        System.out.println(root.data());
    }

d) public void min(Tree root)
    {
        while(root != null)
        {
            root = root.right();
        }
        System.out.println(root.data());
    }

```

17. In a fruit shop there are 30 customers. 12 people choose apples, 16 take oranges and 18 take mangoes. If all the customers take at least one fruit and no one takes all three then the number of customers taking 2 fruits is: -

- a) 16
- b) 6
- c) 8
- d) 20

18. Find the false statement about the division ring (D) :-

- a) For all non-zero $a \in D$ there exists an element $x \in D$ with $a \cdot x = 1$
- b) For all non-zero $a \in D$ there exists an element $x \in D$ with $a \cdot 1 = x$
- c) The Hamiltonian quaternions are an example of a division ring which is not field
- d) Every field is commutative

19. Let R be an equivalence relation on a nonempty set A, and let $a, b \in A$. Which of the following statements are true ?

- a) $[a] \cap [b] = 1$ for all aRb
- b) $[a] = [b]$ if and only if aRb
- c) $[a] = [b]$ for some aRb
- d) $[a] = [b]$ for all aRb

20. Simplify the expression using K-maps: $F(x,y,z) = \pi(0,2,4,5,7)$.

- a) $(y+z)(x+y)(x+z')$
- b) $(x+y)(y+z)(x+z)(x'+z')$
- c) $(y'+z+x)(x+z')$
- d) $(z+y')(y'+z')(x'+y)$

21. Let $(z, *)$ is a group with $m * n = m+n-2$ then the inverse of m is _____

- a) (m^2+6)
- b) $(m+n)/5$
- c) $-(m+4)$
- d) $(3n+4m^2)$

22. Which of the following functions from $Z_6 \rightarrow Z_6$ (The cyclic group of order 6) is injective?
- $f([n]) = [n^3 + 1]$
 - $f([n]) = [2n + 3]$
 - $f([n]) = [n^2 + 3]$
 - All of the above
23. Which of the following statements is NOT equivalent to the statement, "There exists either a man or a woman who loves both animals and birds."
- There exists a person who is a man or a woman who loves both animals and birds.
 - There exists a person who is a man or there exists a person who is a woman who loves both animals or who loves birds.
 - There exists a person who is a man and who loves both animal and Bird or there exists a woman who loves both animal and Bird.
 - There exists a man who loves both animal and Bird or there exists a person who is a woman who loves both animal and Bird.
24. A complete path from G can be explained as a closed walk of graph G which includes every edge G at least once. This means the graph G is
- Hamiltonian
 - Euler
 - Isomorphic
 - Planar
25. There are M people in a hotel, each lodger picks a day to get free room service from the hotel. M is such that there must be at least one group of six people who select the same day. What is the smallest such M if the year is a leap year?
- 1729
 - 1831
 - 1730
 - 1833
26. Which of the following is/are example(s) of stateful application layer protocols?
- HTTP
 - FTP
 - TCP
 - POP3
- and (ii) only
 - and (iii) only
 - and (iv) only
 - only
27. Consider the following types of languages:
- L1 : Regular,
 L2 : Context-free,
 L3 : Recursive,
 L4 : Recursively enumerable.
- Which of the following is/are TRUE?
- $L3 \cup L4$ is recursively enumerable
 - $L2 \cup L3$ is recursive
 - $L1 \cap L2$ is context-free
 - $L1 \cup L2$ is context-free
- I only
 - I and III only
 - I and IV only
 - I, II and III only
28. Match the following:
- | | |
|--------------------------|---------------------------|
| (P) Lexical analysis | (i) Leftmost derivation |
| (Q) Top-down parsing | (ii) Type checking |
| (R) Semantic analysis | (iii) Regular expressions |
| (S) Runtime environments | (iv) Activation records |

- a) $P \leftrightarrow i, Q \leftrightarrow ii, R \leftrightarrow iv, S \leftrightarrow iii$
- b) $P \leftrightarrow iii, Q \leftrightarrow i, R \leftrightarrow ii, S \leftrightarrow iv$
- c) $P \leftrightarrow ii, Q \leftrightarrow iii, R \leftrightarrow i, S \leftrightarrow iv$
- d) $P \leftrightarrow iv, Q \leftrightarrow i, R \leftrightarrow ii, S \leftrightarrow iii$

29. The following functional dependencies hold true for the relational schema $\{V, W, X, Y, Z\}$:

- $V \rightarrow W$
- $VW \rightarrow X$
- $Y \rightarrow VX$
- $Y \rightarrow Z$

Which of the following is irreducible equivalent for this set of functional dependencies?

a)	$V \rightarrow W$ $V \rightarrow X$ $Y \rightarrow V$ $Y \rightarrow Z$
b)	$V \rightarrow W$ $W \rightarrow X$ $Y \rightarrow V$ $Y \rightarrow Z$
c)	$V \rightarrow W$ $V \rightarrow X$ $Y \rightarrow V$ $Y \rightarrow X$ $Y \rightarrow Z$
d)	$Y \rightarrow V$ $W \rightarrow X$ $Y \rightarrow V$ $Y \rightarrow X$ $Y \rightarrow Z$

30. Consider a two-level cache hierarchy with L1 and L2 caches. An application incurs 1.4 memory accesses per instruction on average. For this application, the miss rate of L1 cache is 0.1; the L2 cache experiences, on average, 7 misses per 1000 instructions. The miss rate of L2 expressed correct to two decimal places is _____.

- a) 0.05
- b) 0.06
- c) 0.07
- d) 0.08

31. Identify the correct measure for correctness.

- a) Error per KLOC
- b) \$ per KLOC
- c) Defects per KLOC
- d) All of the above

32. Select the correct defect rate for Six sigma?

- a) 3.4 million per million lines of code.
- b) 3.0 million per million lines of code.
- c) 1.5 million per million lines of code.
- d) 1 million per million lines of code.

33. Which of the following are informed search methods in artificial intelligence(AI)?
- Breadth First Search
 - A* Search
 - Memory Bound Heuristic Search
 - All of the above
34. Among the given options, which is not the required property of Knowledge Representation?
- Inferential Efficiency
 - Inferential Adequacy
 - Representational Verification
 - Representational Adequacy
35. Which of the following algorithm is used to fill the interior of a polygon in Computer Graphics?
- Boundary fill algorithm
 - Scan line polygon fill algorithm
 - Flood fill algorithm
 - All of the above
36. Select the set of colors produced in the beam-penetration method of the color CRT -
- Red, Green, Blue
 - Cyan, Magenta, Blue
 - Red, Green, Orange, Yellow
 - Green, Black, Orange
37. Two processors A and B have clock frequencies of 700 Mhz and 900 Mhz respectively. Suppose A can execute an instruction with an average of 3 steps and B can execute with an average of 5 steps. For the execution of the same instruction which processor is faster?
- A
 - B
 - Both take the same time
 - Insufficient information
38. The average number of steps taken to execute the set of instructions can be made to be less than one by following _____.
- Instruction Set Architecture
 - Pipe-lining
 - Super-scaling
 - Sequential
39. Which parser is known as the shift-reduce parser?
- Bottom-up parser
 - Top-down parser
 - Both Top-down and bottom-up
 - Recursive descent parser
40. Which optimization technique is used to reduce the multiple jumps?
- Latter optimization technique
 - Peephole optimization technique
 - Local optimization technique
 - Code optimization technique

Ph.D. Entrance Examination Computer Applications

Answer Key

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
b	a	a	a	a	a	a	d	b	a
<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>
a	a	a	d	b	a	a	a	b	b
<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>	<u>29</u>	<u>30</u>
c	a	b	b	b	c	d	b	a	a
<u>31</u>	<u>32</u>	<u>33</u>	<u>34</u>	<u>35</u>	<u>36</u>	<u>37</u>	<u>38</u>	<u>39</u>	<u>40</u>
c	a	d	c	c	c	a	c	a	b

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