



Discipline: **COMPUTER APPLICATIONS** (Faculty of Sciences)

3rd PhD ENTRANCE TEST (PET-2018)

Roll No: _____ Date: **3rd June 2018** Signature of the Candidate: _____

1. A binary search tree contains the values 1, 2, 3, 4, 5, 6, 7, 8. The tree is traversed in pre-order and the values are printed out. Which of following sequences is a valid output?

(a) 53124786 (b) 53126487 (c) 53241678 (d) None of the above

2. The in order and preorder traversal of a binary tree beafcg and abdecfg respectively. The post order traversal of binary tree is:

(a) debfgca (b) edbgfca (c) edbfgca (d) defbgca

3. The running time of an algorithm is represented by the following recurrence relation:

$$T(n) = \begin{cases} n & n \leq 3 \\ T\left(\frac{n}{3}\right) + cn & \text{otherwise} \end{cases}$$

Which one of the following represents the time complexity of the algorithm?

- (a) $\theta(n)$
(b) $\theta(n \log n)$
(c) $\theta(n^2)$
(d) $\theta(n^2 \log n)$

4. In 2's complement addition, overflow:

- (a) is flagged whenever there is carry from sign bit addition
(b) cannot occur when a +ve value is added to a -ve value
(c) is flagged when the carries from sign bit and previous bit match
 (d) All of the above

5. The characters a to h have the set of frequencies based on the first 8 Fibonacci numbers as follows:

a: 1, b: 1, c: 2, d: 3, e: 5, f: 8, g: 13, h: 21

A Huffman code is used to represent the characters. What is the sequence of characters corresponding to the following code?

1101111000111010

(a) fdheg (b) ecgdf (c) dchfg (d) fehdg

6. A binary search tree is generated by inserting in order the following integers: 50, 15, 62, 5, 20, 58, 98, 3, 8, 37, 60, 24. The number of nodes in the left sub tree and right sub tree of the root respectively is:

(a) (4, 7) (b) (7, 4) (c) (8, 3) (d) (3, 8)



7. The grammar $A \rightarrow AA \mid (A) \mid \epsilon$ is not suitable for predictive parsing because the grammar is:
- (a) Ambiguous (b) Left- recursive (c) Right-recursive (d) an operator grammar
8. The maximum number of processes that can be in ready state for a computer with n CPUs is:
- (a) n (b) n^2 (c) 2^n (d) Independent of n
9. If the time-slice used in the round-robin scheduling policy is more than the maximum time required to execute any process, then the policy will:
- (a) Degenerate to shortest job first
 (b) Degenerate to priority scheduling
 (c) Degenerate to first come first serve
 (d) None of the above
10. A critical section is a program segment:
- (a) Which should run in certain specified amount of time
 (b) Which avoids deadlocks
 (c) Where shared resources are accessed
 (d) Which must be enclosed by a pair of semaphore operations, P and V
11. Consider a machine with 64 MB physical memory and a 32-bit virtual address space. If the page size of 4 KB, what is the approximate size of the page table?
- (a) 16 MB (b) 8 MB (c) 2 MB (d) 24 MB
12. The correct matching for the following pairs is:
- | | |
|-------------------------|----------------|
| A. Disk scheduling | 1. Round robin |
| B. Batch processing | 2. SCAN |
| C. Time sharing | 3. LIFO |
| D. Interrupt processing | 4. FIFO |
- (a) A-3, B-4, C-2, D-1 (b) A-4, B-3, C-2, D-1 (c) A-2, B-4, C-1, D-3 (d) A-3, B-4, C-3, D-2
13. Let $R = (A, B, C, D, E, F)$ be a relation scheme with the following dependencies $C \rightarrow F$, $E \rightarrow A$, $EC \rightarrow D$, $A \rightarrow B$. Which of the following is a key for R ?
- (a) CD (b) EC (c) AE (d) AC
14. In a schema with attributes A, B, C, D and E following set of functional dependences are given:
- $A \rightarrow B$
 $A \rightarrow C$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$
- Which of the following functional dependencies is NOT implied by above set?
- (a) $CD \rightarrow AC$ (b) $BD \rightarrow CD$ (c) $BC \rightarrow CD$ (d) $AC \rightarrow BC$



15. Which of the following relational query languages have the same expressive power?
 I Relational algebra
 II Tuple relational calculus restricted to safe expressions
 III Domain relational calculus restricted to safe expressions
- (a) II and III only (b) I and II only (c) I and III only (d) All three
16. Consider a parity check code with three data bits four parity check bits. Three of the code words are 0101011, 1001101 and 111001.
 Which of the following are also code words?
 I. 0010111
 II. 0110110
 III. 1011010
 IV. 0111010
- (a) I and III (b) I, II and III (c) II and IV (d) I, II, III and IV
17. The address resolution protocol (ARP) is used for:
- (a) Finding the IP address from the DNS
 (b) Finding the IP address of the default gateway
 (c) Finding the IP address that corresponds to MAC address
 (d) Finding the MAC address that corresponds to an IP address
18. Count to infinity is a problem associated with:
- (a) Link state routing protocol. (b) Distance vector routing protocol
 (c) Clustering (d) TCP Congestion Control
19. Which one of the following is TRUE about the interior gateway routing protocols- Routing Information Protocol (RIP) and Open Shortest path First (OSPF)?
- (a) RIP uses distance vector routing and OSPF uses link state routing
 (b) OSPF uses distance vector routing and RIP uses link state routing
 (c) Both RIP and OSPF use link state routing
 (d) Both RIP and OSPF use distance vector routing
20. Match the following:
- List-I**
- (1) Waterfall model
 - (2) Evolutionary model
 - (3) Component-based software engineering
 - (4) Spiral development
- List-II**
- (a) Specification can be developed incrementally
 - (b) Requirements compromises are inevitable
 - (c) Explicit recognition of risk
 - (d) Inflexible partitioning of the project into stages
- (a) 1-a, 2-b, 3-c, 4-d (b) 1-d, 2-a, 3-b, 4-c (c) 1-d, 2-b, 3-a, 4-c (d) 1-c, 2-a, 3-b, 4-d



21. Consider a machine with byte addressable main memory of 2020 bytes, block size of 16 bytes and a direct mapped cache having 212 cache lines. Let the address 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 $(E201F)_{16}$?

- (a) E, 201 (b) F, 201 (c) E, E20 (d) 2, 01F

22. Which of the following regular expression identities is true?

- (a) $r^* = r^*$ (b) $(r^* s^*)^* = (r + s)^*$ (c) $(r + s)^* = r^* + s^*$ (d) $r^* s^* = r^* + s^*$

23. Let S and T be language over $\epsilon = \{a, b\}$ represented by the regular expressions $(a + b^*)^*$ and $(a+b)^*$, respectively. Which of the following is true?

- (a) $S \subset T$ (b) $T \subset S$ (c) $S = T$ (d) $S \cap T = \emptyset$

24. Consider a CFG with the following productions:

- $S \rightarrow AA \mid B$
 $A \rightarrow 0A \mid A0 \mid 1$
 $B \rightarrow 0B00 \mid 1$

S is the start symbol, A and B are non-terminals and 0 and 1 are the terminals. The language generated by this grammar is

- (a) $\{0^n 10^{2n} \mid n \leq 1\}$
 (b) $\{0^i 10^j 10^k \mid i, j, k \geq 0\} \cup \{0^n 10^{2n} \mid n \geq 1\}$
 (c) $\{0^i 10^j \mid i, j \geq 0\} \cup \{0^n 10^{2n} \mid n \geq 1\}$
 (d) The set of all string over $\{0, 1\}$ containing at least two 0's

25. Consider the regular language $L = (111+11111)^*$. The minimum number of states in any DFA accepting this language is:

- (a) 3 (b) 5 (c) 8 (d) 9

26. Let $f(w,x,y,z) = \sum (0, 4, 5, 7, 8, 9, 13, 15)$. Which of the following expressions are NOT equivalent to f?

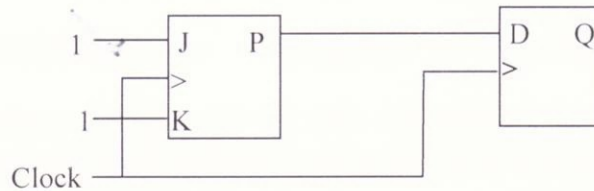
- (a) $x'y'z' + w'xy' + wy'z + xz$
 (b) $w'y'z + wx'y + xz$
 (c) $w'y'z + wx'y + xyz + xy'z$
 (d) $x'y'z + wx'y' + w'y$

27. The minterm expansion of $f(P,Q,R) = PQ + QR + \overline{P}R$ is:

- (a) $m_2 + m_4 + m_6 + m_7$
 (b) $m_0 + m_1 + m_3 + m_5$
 (c) $m_0 + m_1 + m_6 + m_1$
 (d) $m_2 + m_3 + m_4 + m_5$



28. The following arrangement of master- slave flips flops.



Has the initial state of P, Q as 0, 1 (respectively). After the clock cycles the output state P, Q (respectively):

- (a) 1, 0 (b) 1, 1 (c) 0, 0 (d) 0, 1

29. A cache line is 64 bytes. The main memory has latency 32ns and bandwidth 1GB/s. The time required to fetch the entire cache line from the main memory is:

- (a) 32 ns (b) 64 ns (c) 96 ns (d) 128 ns

30. How many 32K× 1RAM chips are needed to provide a memory capacity of 256 K-bytes?

- (a) 8 (b) 32 (c) 64 (d) 128

31. Consider the following C declaration

```

struct{
    short s[5];
    union{
        float y;
        long z;
    };
};
    
```

Assume that objects of the type short, float and long occupy 2 bytes, 4 bytes and 8 bytes, respectively. The memory requirement for variable t, ignoring alignment considerations, is

- (a) 22 bytes (b) 14 bytes (c) 18 bytes (d) 10 bytes

32. Consider the following relation

Cinema (theatre, address, capacity)

Which of the following options will be needed at the end of the SQL query

SELECT P1. address

FROM Cinema P1

Such that it always finds the addresses of theatres with maximum capacity?

- (a) WHERE P1. Capacity >= All (select P2. Capacity from Cinema P2)
 (b) WHERE P1. Capacity >= Any (select P2. Capacity from Cinema P2)
 (c) WHERE P1. Capacity >= All (select max(P2. Capacity) from Cinema P2).
 (d) WHERE P1. Capacity >= Any (select max (P2. Capacity) from Cinema P2)

33. The command "mknod myfifo b 4 16"

- (a) will create a block device if user is root
 (b) will create a block device for all users
 (c) will create a FIFO if user is not root
 (d) None of the above



34. While booting the system the IP address is ...?
- (a) 1.1.1.1 (b) 1.1.0.0 (c) 0.0.1.1 (d) 0.0.0.0
35. Six files F1, F2, F3, F4, F5, and F6 have 100, 200, 50, 80, 120, 150 number of records respectively. In what order should they be stored so as to optimize access time? Assume each file is accessed with the same frequency.
- (a) F3, F4, F1, F5, F6, F2
 (b) F2, F6, F5, F1, F4, F3
 (c) F1, F2, F3, F4, F5, F6
 (d) F6, F5, F4, F3, F2, F1
36. In the following pairs of OSI protocol layer/sub-layer and its functionality, the **INCORRECT** pair is
- (a) Network layer and Routing
 (b) Data Link Layer and Bit synchronization
 (c) Transport layer and End-to-end process communication
 (d) Medium Access Control sub-layer and Channel sharing
37. Host A (on TCP/IPv4 network A) sends an IP datagram D to host B (also on TCP/IPv4 network B). Assume that no error occurred during the transmission of D. When D reaches B, which of the following IP header field(s) may be different from that of the original datagram D?
- (i) TTL (ii) Checksum (iii) Fragment Offset
- (a) (i) only (b) (i) and (ii) only (c) (ii) and (iii) only (d) (i), (ii) and (iii)
38. Consider the following array of elements:
 <89,19,50,17,12,15,2,5,7,11,6,9,100>
- The minimum number of interchanges needed to convert it into a max-heap is
- (a) 4 (b) 5 (c) 2 (d) 3
39. What is the output of this C code?
- ```
void foo();int main()
{
void foo(int);
foo();
return 0;
}
void foo()
{
printf("2");
}
```
- (a) 2    (b) Compile time error   (c) Depends on the compiler   (d) Depends on the standard
40. A SRS document should avoid discussing which one of the following?
- (a) User Interface issues  
 (b) Non functional requirements  
 (c) Design specification  
 (d) Interface with third party software

