ISRO SAMPLE PAPER FOR RESEARCH PROGRAM

This paper consists of 80 multiple choice questions each carrying +3 marks for correct answer and -1 for wrong answer.
The full set covers the full syllabus of Computer Science and Engineering Department.
All questions are mandatory.

Full Marks:240 Time:90 minutes

1. T is a graph with n vertices. T is connected and has exactly n-1 edges, then
1. T is a tree
2. T contains no cycles
3. Every pair of vertices in T is connected by exactly one path
4. All of these
2. The number of edges in complete graph with 'n' vertices is
1. n(n - 1)
2. n(n - 1) / 2
3. n^2
4. 2n - 1
3. The maximum number of nodes in a binary tree of depth 10 is
1. 1024
2. 2^{10}-1
3. 1000
4. None of the above
4. The complexity of krushkal's minimum spanning tree algorithm on a graph with 'n' nodes and 'e' edges is
1. O(n)
2. O(n log n)
3. O(e log n)
4. O(e)
5. In a MIU puzzle, either of the letters M, I or U could go as a start symbol. Production rules are given
below:
R_1: U->IU R_2:M.x->M.x.x, where '.' is a string concatenation operator.
Given this which of the following holds
for i. MIUIUI
UIUIU ii. MIUIUIUIUIUIUIU
1. Either i or ii but not both of these are valid words
2. Both i and ii are valid words and they take identical number of transformations for the production
3. Both i and ii are valid words but they take involve different number of transformations for the production
4. None of these
6. The regular expression a + b denotes the set :
1. {a}
2. {Є, a, b}
3. {a, b}
4. None of these
7. In order to build a MOD-18 counter, the minimum number of flip flops needed is equal to:
1. 18
2. 9
3. 5
4. 4
8. Which of the following expressions remove hazard form: xy + zx'?
1. xy + zx'
2. xy + zx'
3. xy + zx' + yz

4. xy + zx’ + wz
9. The octal equivalent of the hexadecimal number FF is
1. 100
2. 150
3. 377
4. 737
10. Recursive functions are executed in a
1. First in first out order
2. Last in first out order
3. Parallel fashion
4. Load balancing
11. Which of the following is a MAC address?
1. 192.166.200.50
2. 00056A:01A5CCA7FF60
3. 568, Airport Road
4. 01:A5:BB:A7:FF:60
12. If a graph requires k different colors for its proper coloring, then the chromatic number of the graph is
1. 1
2. K
3. K-1
4. k/2
13. In Ethernet, the source address field in the MAC frame is the _____
1. Original sender’s physical
2. Previous station’s physical
3. Next destination’s physical
4. Original sender’s service port
14. Using larger block size in a fixed block size file system leads to
1. Better disk throughput but poorer disk space utilization
2. Better disk throughput and better disk space utilization
3. Poorer disk throughput but better disk space utilization
4. Poorer disk throughput and poorer disk space utilization
15. By using an eight bit optical encoder the degree of resolution that can be obtained is approximately
1. 1.8^0
2. 2.4^0
3. 3.8^0
4. 1.4^0
16. Which of the following transmission media is not readily suitable to CSMA operation?
1. Radio
2. Optical Fibers
3. Coaxial cable
4. Twisted pair
17. The range of integers that can be represented by an n-bit 2’s complement number system is
1. -2^{n-1} to $(2^{n-1}-1)$
2. $-(2^{n-1}-1)$ to $(2^{n-1}-1)$
3. -2^{n-1} to 2^{n-1}
4. $-(2^{n-1}+1)$ to $(2^{n-1}-1)$
18. The number of digit 1 in the binary representation of : 3 X 512 + 7 X 64 + 5 X 8 + 3
1. 8
2. 9
3. 10
4. 12
19. Assume that each character code consists of 8 bits. The number of characters that can be transmitted per second through an synchronous serial line at 2400 baud rate, and with two stop bits is

1. 109
2. 218
3. 219
4. 216

20. Suppose the numbers 7, 5, 1, 8, 3, 6, 0, 9, 4, 2 are inserted in that order into an initially empty binary search tree. The binary search tree uses the usual numbering on natural numbers. What is the inorder traversal sequence of the resultant tree?

1. 7 5 1 0 3 2 4 6 8 9
2. 0 2 4 3 1 6 5 9 8 7
3. 0 1 2 3 4 5 6 7 8 9
4. 9 8 6 4 2 3 0 1 5 7

21. Half adder is also known as

1. AND circuit
2. NAND circuit
3. NOR circuit
4. EX-OR circuit

22. Which of the following is not true in C++?

1. “Private” elements of a base class are not accessible by members of its derived class
2. “Protected” elements of a base class are not accessible by members of its derived class
3. When base class access is specified “Public”, public elements of the base class becomes public members of its derived class
4. When base class access is specified “Public”, protected elements of the base class becomes protected members of its derived class

23. What is the maximum counting speed of a 4-bit binary counter which is composed of Flip-Flop with a propagation delay of 25ns?

1. 1MHz
2. 10MHz
3. 100MHz
4. 4MHz

24. Consider the following C code.

```
{ int a = 5, b =9;
        float r;
            r = b/a;}
```

What is the value of r?

1. 1.8
2. 1.0
3. 2.0
4. 0.0

25. Specialization is a _____ process.

1. Top-down
2. Bottom-up
3. Both (a) and (b)
4. None of these

26. The five items: A, B, C, D and E are pushed in a stack, one after the other starting from A. the stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back into the stack. Now one item is popped from the stack. The popped item is

1. A
2. B
3. C
4. D

27. An Ethernet hub

1. Functions as a repeater
2. Connects to a digital PBX

3. Connects to a token-ring network
4. Functions as a gateway
28. The address space of 8086 CPU is
1. One megabyte
2. 256 kilobyte
3. 1k megabyte
4. 64 kilobyte
29. Consider the following sequence of instructions: $a = a \oplus b$, $b = a \oplus b$, $a = b \oplus a$. This sequence
1. Retains the value of a and b
2. Complements the value of a and b
3. Swap a and b
4. Negates value of a and b
30. Consider a rooted tree in which every node has atleast three children. What is the minimum number of nodes at level i (i>0) of the tree? Assume that the root is at level 0.
1. 3^i
2. 3i
3. 3
4. 3i+1
31. The following loop in C

```
int i = 0;
while(i++<0)      i- -;
```

1. Will terminate
2. Will go into an infinite loop
3. Will give compilation error
4. Will never be executed
32. Which of the following can be the sequence of nodes examined in a binary search tree while searching for the key 98?
1. 100, 50, 75, 60, 98
2. 100, 120, 90, 95, 98
3. 200, 70, 100, 95, 98
4. 75, 150, 90, 80, 98
33. If the number of leaves in a strictly binary tree is an odd number, then what can you say with full conviction about total number of nodes in the tree?
1. It is an odd number
2. It is an even number
3. It cannot be equal to the number of leaves
4. It is always greater than twice the number of leaves
34. A CPU has 24- bit instruction. A program starts at address 300 (in decimal). Which one of the following is a legal program counter (all values in decimal)?
1. 400
2. 500
3. 600
4. 700
35. Study the following program:

```
//precondition: x>=0
public void demo(int x) {
    System.out.print(x%10);
    if((x/10)!=0)
        demo(x/10);
    System.out.pri
```

nt(x%10); }

Which of the following is printed as a result of the call demo(1234)?

1. 1441
2. 3443
3. 12344321
4. 43211234

36. If $(12x)_3 = (123)_x$, then the value of x is
1. 3
2. 3 or 4
3. 2
4. none of the above

37. Function over loading done at:
1. Runtime
2. Compile time
3. Linking time
4. Switching from function to function

38. The height of a binary tree with 'n' nodes, in the worst case is
1. O(log n)
2. O(n)
3. Ω(n log n)
4. $\Omega(n^2)$

39. A recursive foreign key is a
1. References a relation
2. References a table
3. References its own relation
4. References a foreign key

40. For slotted ALOHA, the maximum channel utilization is:
1. 100%
2. 50%
3. 36%
4. 18%

41. What is the maximum window size in sliding window protocol used in a computer network?
1. 4
2. 8
3. 15
4. 16

42. How many 2-input multiplexers are required to construct a 2^{10}-input multiplexer?
1. 1023
2. 31
3. 10
4. 127

43. Bit stuffing refers to
1. Inserting a '0' in a user stream to differentiate it with a flag
2. Inserting a '0' in flag stream to avoid ambiguity
3. Appending a nibble to the flag sequence
4. Appending a nibble to the use data stream

44. The use of multiple register windows with overlap causes a reduction in the number of memory accesses
for 1. Function locals and parameters 2. Register saves and restores 3. Instruction fetches
1. 1 only

2. 2 only
3. 3 only
4. 1, 2 and 3

45. An embedded printer provides:
1. Physical record key
2. An inserted index
3. A secondary access path
4. All of the above

46. An example of file extension is
1. text
2. pict
3. mp3
4. web

47. Pre order is also known as
1. Depth first order
2. Breadth first order
3. Topological order
4. Linear order

48. An example of a public key encryption algorithm is
1. Ceaser cipher algorithm
2. DES algorithm
3. AES algorithm
4. Knapsack algorithm

49. Which of the following are Data Link Layer standard? 1. Ethernet 2. HSSI 3. Frame Relay 4. 10 Base-T 5. Token Ring
1. 1, 2, 3
2. 1, 3, 5
3. 1, 3, 4, 5
4. 1, 2, 3, 4, 5

50. A computer uses 8 digit mantissa and 2 digit exponent. If a = 0.052 and b = 28E + 11, then b+ a-b will
1. Result in an overflow error
2. Result in an underflow error
3. Be 0
4. Be 5.28E + 11

51. Two numbers given below are multiplied using the Booth's algorithm. Multiplicand: 0101 1010 1110 1110 Multiplier: 0111 0111 1011 1101 How many addition/subtractions are required for the multiplication of the above two numbers?
1. 6
2. 8
3. 10
4. 12

52. The level of aggregation of information required for operational control is
1. Detailed
2. Aggregate
3. Qualitative
4. None of the above

53. A locked file can be
1. Accessed by only one user
2. Modified by users with the correct password
3. Is used to hide sensitive information
4. Both (b) and (c)

54. The best known example of a MAN is
1. Ethernet

2. Cable television
3. FDDI
4. IEEE 802.3

55. A top-down Parse generates:
1. Right most derivation
2. Right most derivation, in reverse
3. Left most derivation
4. Left most derivation, in reverse

56. With reference to hierarchical routing, the optimum number of levels for an *m* router subnet is
1. m^2
2. m
3. ln m
4. $\sqrt{m}$

57. Device on one network can communicate with devices on another network via a
1. Hub/Switch
2. Utility server
3. File server
4. Gateway

58. In an SR latch made by cross coupling two NAND gates, if both S and R inputs are set to 0, then it will result in
1. Q=0, Q0=1
2. Q=1, Q0=0
3. Q=1, Q0=1
4. Intermediate states

59. The addition of 4-bits, two's complement binary numbers 1101 and 0100 results in
1. 0001 and an overflow
2. 1001 and no overflow
3. 0001 and no overflow
4. 1001 and an overflow

60. Which of the following is not a valid rule for XOR?
1. 0 XOR 0 = 0
2. 1 XOR 1 = 1
3. 1 XOR 0 = 1
4. B XOR B = 0

61. A hash function f defined as f(key) = key mod 7, with linear probing it is used to insert the key 37, 38, 72, 48, 98, 11, 56 into a table index from 0 to 6. What will be the location of 11.
1. 3
2. 4
3. 5
4. 6

62. The maximum data rate of binary signals on a noiseless 3KHz channel is:
1. 3000 bps
2. 6000 bps
3. 9000 bps
4. 12,000 bps

63. Symbol table can be used for:
1. Checking type compatibility
2. Suppressing duplication of error message
3. Storage allocation
4. All of the above

64. At the end of parsing
1. Tokens are identified
2. Set of instructions
3. The syntactic groups are identified
4. Machine instructions are identified

65. Context free grammar(CFG) can recognized by
1. Finite state automata
2. 2-way linear bounded automata
3. Push down automata
4. Both (b) and (c)

66. The initial configuration of a queue is a, b, c, d. 'a' is at the front. To get the configuration d, c, b, a. How many deletions and additions are required:
1. 2 deletions, 3 additions
2. 3 deletions, 2 additions
3. 3 deletions, 4 additions
4. 3 deletions, 3 additions

67. The shift operator E is defined as $E[f(x_i)] = f(x_i + h)$ and $E^{-1}[f(x=_i)] = f(x_i - h)$ then Δ(forward difference)in terms of E is
1. E^{-1}
2. E
3. $1-E^{-1}$
4. 1-E

68. Ring counter is analogous to
1. Toggle switch
2. Latch
3. Stepping switch
4. S-R flip-flop

69. The number of distinct simple graphs with upto three nodes is
1. 5
2. 10
3. 7
4. 9

70. _____ provides a method to recover data that has been delivered but not get used:
1. Segmentation
2. Concatenation
3. Translation
4. Synchronization

71. Encryption and decryption are the functions of which layer of OSI model?
1. Transport
2. Session
3. Router
4. Presentation

72. A single instruction in an assembly language program contains
1. One micro operation
2. One macro operation
3. One instruction to be completed in a single pulse
4. One machine code instruction

73. Windows is a _____ operating system.
1. Non preemptive
2. Preemptive
3. Multi user
4. Real time

74. Assembler program is
1. Dependent on the operating system
2. Dependent on the compiler
3. Dependent on the hardware
4. Independent of the hardware

75. A semaphore count of negative n means s = -n that the queue contains ____ waiting process.

1. n + 1
2. n
3. n – 1
4. 0

76. The network 198.78.41.0 is a
1. Class A network
2. Class B network
3. Class C network
4. Class D network

77. The hexadecimal equivalent of 01111100110111100011 is
1. CD73E
2. ABD3F
3. 7CDE3
4. FA4CD

78. If in a graph G there is one and one path between every pair of vertices then G is a
1. Path
2. Walk
3. Tree
4. Circuit

79. Producer- Consumer problem can be solved using
1. Semaphores
2. Event counters
3. Monitors
4. All of the above

80. Absolute loader demands that the programmer needs to know the:
1. Start address of the available main memory
2. Total size of the program
3. Actual address of the data location
4. Absolute values of the operand used