PAPER : NOV. 2017

UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

PAPER-II

Note: This paper contains **fifty(50)** objective type questions for **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. If the time is now 4 O' clock, what will be the time after 101 hours from now ?
(a) 9 O' clock (b) 8 O' clock (c) 5 O' clock (d) 4 O' clock

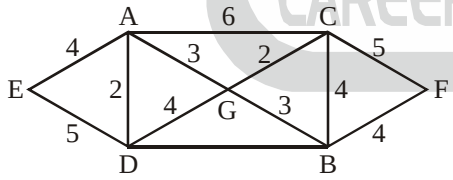
2. Let $m = (313)_4$ and $n = (322)_4$. Find the base 4 expression of m + n.
(a) $(635)_4$ (b) $(32312)_4$ (c) $(21323)_4$ (d) $(1301)_4$

3. Let $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$. Find the boolean product $A \odot B$ of the two matrices.

(a) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$

4. How many distinguishable permutations of the letters in the word BANANA are there ?
(a) 720 (b) 120 (c) 60 (d) 360

5. Consider the graph given below :



Use Kruskal's algorithm to find a minimal spanning tree for the graph. The list of the edges of the tree in the oder in which they are choosen is ?
(a) AD, AE, AG, GC, GB, BF (b) GC, GB, BF, GA, AD, AE
(c) GC, AD, GB, GA, BF, AE (d) AD, AG, GC, AE, GB, BF

6. The Boolean function with the Karnaugh map

CD \ AB	00	01	11	10
00	0	1	1	0
01	0	1	1	1
11	1	1	1	1
10	0	1	1	0

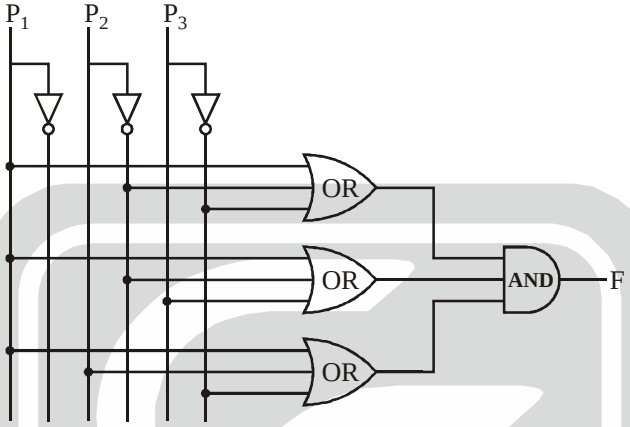
is :
(a) (A + C)·D + B (b) (A + B)·C + D (c) (A + D)·C + B (d) (A + C)·B + D

7. The Octal equivalent of the binary number 1011101011 is
(a) 7353 (b) 1353 (c) 5651 (d) 5657

8. Let P and Q be two propositions, $\neg(P \leftrightarrow Q)$ is equivalent to :
(a) $P \leftrightarrow \neg Q$ (b) $\neg P \leftrightarrow Q$ (c) $\neg P \leftrightarrow \neg Q$ (d) $Q \rightarrow P$

9. Negation of the proposition $\exists\, x\, H(x)$ is :
(a) $\exists\, x \neg H(x)$ (b) $\forall\, x \neg H(x)$ (c) $\forall\, x\, H(x)$ (d) $\neg\, x\, H(x)$

10. The output of the following combinational circuit is F :



The value of F is :
(a) $P_1 + P_2'P_3$ (b) $P_1 + P_2'P_3'$ (c) $P_1 + P_2P_3'$ (d) $P_1' + P_2P_3$

11. 'ptrdata' is a pointer to a data type. The expression *ptrdata++ is evaluated as (in C++) :
(a) *(ptrdata++) (b) (*ptrdata)++ (c) *(ptrdata)++ (d) depends on compiler

12. The associativity of which of the following operators is Left to Right, in C++ ?
(a) Unary operator (b) Logical not
(c) Array element access (d) Addressof

13. A member function can always access the data in ..... , (in C++).
(a) the class of which it is member (b) the object of which it is a member
(c) the public part of its class (d) the private part of its class

14. Which of the following is not correct for virtual function in C++ ?
(a) Must be declared in public section of class
(b) Virtual function can be static
(c) Virtual function should be accessed using pointers
(d) Virtual function is defined in base class

15. Which of the following is not correct (in C++) ?
(a) Class templates and function templates are instantiated in the same way.
(b) Class templates differ from function templates in the way they are initiated.
(c) Class template is initiated by defining an object using the template argument.
(d) Class template are generally used for storage classes.

16. Which of the following is/are TRUE with reference to 'view' in DBMS ?
(A) A 'view' is a special stored procedure executed when certain event occurs.
(B) A 'view' is a virtual table, which occurs after executing a pre-compiled query.
Code :
(a) Only (A) is true (b) Only (B) is true
(c) Both (A) and (B) are true (d) Neither (A) nor (B) are true

17. In SQL, ... is an Aggregate function.
(a) SELECT (b) CREATE (c) AVG (d) MODIFY

18. Match the following with respect to RDBMS :

A. Entity integrity	1. enforces some specific business rule that do not fall into entity or domain.
B. Domain integrity	2. rows can't be deleted which are used by other records.
C. Referential integrity	3. enforces valid entries for a column.
D. Userdefined integrity	4. No duplicate rows in a table.

Code :

	A	B	C	D
(a)	3	4	1	2
(b)	4	3	2	1
(c)	4	2	3	1
(d)	2	3	4	1

19. In RDBMS, different classes of relations are created using ..... technique to prevent modification anomalies.
(a) Functional dependencies (b) Data integrity
(c) Referential integrity (d) Normal forms

20. ..... SQL command changes one or more field in a record.
(a) LOOK-UP (b) INSERT (c) MODIFY (d) CHANGE

21. Consider an array representation of an n element binary heap where the elements are stored from index 1 to index n of the array. For the element stored at index i of the array (i < = n), the index of the parent is :
(a) floor ((i + 1)/2) (b) ceiling ((i + 1)/2) (c) floor (i/2) (d) ceiling (i/2)

22. The following numbers are inserted into an empty binary search tree in the given order :
10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree ?
(a) 3 (b) 4 (c) 5 (d) 6

23. Let G be an undirected connected graph with distinct edge weight. Let E_{max} be the edge with maximum weight and E_{min} the edge with minimum weight. Which of the following statements is false ?
(a) Every minimum spanning tree of G must contain E_{min}.
(b) If E_{max} is a minimum spanning tree, then its removal must disconnect G.
(c) No minimum spanning tree contains E_{max}.
(d) G has a unique minimum spanning tree.

24. A list of n strings, each of length n, is sorted into lexicographic order using merge - sort algorithm. The worst case running time of this computation is :
(a) O(n log n) (b) $O(n^2 \log n)$ (c) $O(n^2 + \log n)$ (d) $O(n^3)$

25. Postorder traversal of a given binary search tree T produces following sequence of keys :
3, 5, 7, 9, 4, 17, 16, 20, 18, 15, 14
Which one of the following sequences of keys can be the result of an in-order traversal of the tree T?
(a) 3, 4, 5, 7, 9, 14, 20, 18, 17, 16, 15 (b) 20, 18, 17, 16, 15, 14, 3, 4, 5, 7, 9
(c) 20, 18, 17, 16, 15, 14, 9, 7, 5, 4, 3 (d) 3, 4, 5, 7, 9, 14, 15, 16, 17, 18, 20

26. Which of the following devices takes data sent from one network device and forward it to the destination node based on MAC address ?
(a) Hub (b) Modem (c) Switch (d) Gateway

27. ..... do not take their decisions on measurements or estimates of the current traffic and topology.
(a) Static algorithms (b) Adaptive algorithms
(c) Non-adaptive algorithms (d) Recursive algorithms

28. The number of bits used for addressing in Gigabit Ethernet is .....
(a) 32 bits (b) 48 bits (c) 64 bits (d) 128 bits

29. Which of the following layer of OSI reference model is also called end-to-end layer ?
(a) Network layer (b) Datalink layer (c) Session layer (d) Transport layer

30. The IP address ..... is used by host when they are being booted.
(a) 0.0.0.0 (b0 1.0.0.0 (c) 1.1.1.1 (d) 255.255.255.255

31. Consider the followig program fragment in assembly language :

```
        mov ax, 0h
        mov cx, 0A h
doloop :
        dec ax
        loop doloop
```

What is the value of a*x* and c*x* registers after the completion of the doloop ?
(a) a*x* = FFF5 h and c*x* = 0 h (b) a*x* = FFF6 h and c*x* = 0 h
(c) a*x* = FFF7 h and c*x* = 0A h (d) a*x* = FFF5 h and c*x* = 0A h

32. Consider the following assembly program fragment

```
stc
mov al, 11010110b
mov cl, 2
rcl al, 3
rol al, 4
shr al, cl
mul cl
```

The contents of the destination register a*x* (in hexadecimal) and the status of Carry Flag (CF) after the execution of above instruction, are :
(a) a*x* = 003CH; CF = 0 (b) a*x* = 001EH; CF = 0
(c) a*x* = 007BH; CF = 1 (d) a*x* = 00B7H; CF = 1

33. Which of the following regular expressions, each describing a language of binary numbers (MSB to LSB) that represents non-negative decimal values, does not include even values ?
(a) $0^*1^+0^*1^*$ (b) $0^*1^*0^+1^*$ (c) $0^*1^*0^*1^+$ (d) $0^+1^*0^*1^*$

34. Which of the following statements is/are TRUE ?
A. The grammar $S \rightarrow SS \mid a$ is ambiguous. (Where S is the start symbol)
B. The grammar $S \rightarrow 0S1 \mid 01S \mid \in$ is ambiguous. (The special symbol $\in$ represents the empty string). (Where S is the start symbol)
C. The grammar (Where S is the start symbol)
$S \rightarrow T/U$
$T \rightarrow xSy \mid xy \mid \in$
$U \rightarrow yT$

generates a languages consisting of the string *yxxyy*.

(a) Only (A) and (B) are true (b) Only (A) and (C) are true
(c) Only (B) and (C) are true (d) All of (A), (B) and (C) are true

35. Match the description of several parts of a classic optimizing compiler in List-I, with the names of those parts in List-II :

List-I

A. A part of a compiler that is responsible for recognizing syntax.
B. A part of a compiler that takes as input a stream of characters and produces as output a stream of words along with their associated syntactic categories.
C. A part of a compiler that understand the meanings of variable names and other symbols and check that they are used in ways consistent with their definitions.
D. An IR-to-IR transformer that tries to improve that IR program in some way (Intermediate Representation).

List-II

(i) Optimizer
(ii) Semantic Analysis
(iii) Parser
(iv) Scanner

Code :

	A	B	C	D
(a)	(iii)	(iv)	(ii)	(i)
(b)	(iv)	(iii)	(ii)	(i)
(c)	(ii)	(iv)	(i)	(iii)
(d)	(ii)	(iv)	(iii)	(i)

36. In distributed system, the capacity of a system to adapt the increased service load is called .....
(a) Tolerance (b) Scalability (c) Capability (d) Loading

37. In ..... disk scheduling algorithm, the disk head moves from one end to other end of the disk, serving the request along the way. When the head reaches the other end, it immediately returns to the beginning of the disk without serving any requests on the return trip.
(a) LOOK (b) SCAN (c) C-LOOK (d) C-SCAN

38. Suppose there are six files F1, F2, F3, F4, F5, F6 with corresponding sizes 150 KB, 225 KB, 75 KB, 60 KB, 275 KB and 65 KB respectively. The files are to be stored on a sequential device in such a way that optimizes access time. In what order should the files be stored ?
(a) F5, F2, F1, F3, F6, F4 (b) F4, F6, F3, F1, F2, F5
(c) F1, F2, F3, F4, F5, F6 (d) F6, F5, F4, F3, F2, F1

39. Which module gives control of the CPU to the process selected by the short-term schedular ?
(a) Dispatcher (b) Interrupt (c) Schedular (d) Threading

40. Two atomic operations permissible on Semaphores are ..... and .....
(a) wait, stop (b) wait, hold (c) hold, signal (d) wait, signal

41. Software does not wear-out in the traditional sense of the term, but software does tend to deteriorate as it evolves, because :
(a) Software suffers from exposure to hostile environments.
(b) Defects are more likely to arise after software has been used often.
(c) Multiple change requests introduce errors in component interactions.
(d) Software spare parts become harder to order.

42. Software re-engineering is concerned with :
(a) Re-constructing the original source code from the existing machine (low-level) code program and modifying it to make it more user - friendly.
(b) Scrapping the source code of a software and re-writing it entirely from scratch.
(c) Re-organising and modifying existing software system to make them more maintainable.
(d) Translating source code of an existing software to a new machine (low-level) language.

43. Which of the following is not a key issue stressed by an agile philosophy of software engineering ?
(a) The importance of self-organizing teams as well as communication and collaboration between team members and customers.
(b) Recognition that change represents opportunity.
(c) Emphasis on rapid delivery of software that satisfies the customer.
(d) Having a separate testing phase after a build phase.

44. What is the normal order of activities in which traditonal software testing is organized ?
(A) Integration testing (B) System testing (C) Unit testing (D) Validation testing
Codes :
(a) (C), (A), (B), (D) (b) (C), (A), (D), (B) (c) (D), (C), (B), (A) (d) (B), (D), (A), (C)

45. Which of the following testing techniques ensures that the softwares product runs correctly after the changes during maintenance ?
(a) Path testing (b) Integration testing (c) Unit testing (d) Regression testing

46. Which of the following Super Computers is the fastest Super Computer ?
(a) Sun-way TaihuLight (b) Titan
(c) Piz Daint (d) Sequoia

47. Which of the following statements about ERP system is true ?
(a) Most ERP software implementations fully achieve seamless integration.
(b) ERP software packages are themselves combinations of separate applications for manufacturing, materials, resource planning, general ledger, human resources, procurement and order entry.
(c) Integration of ERP system can be achieved in only one way.
(d) An ERP package implemented uniformly throughout an enterprise is likely to contain very flexible connections to allow charges and software variations.

48. Which of the following is not a Clustering method ?
(a) K-Mean method (b) Self Organizing feature map method
(c) K-nearest neighbour method (d) Agglomerative method

49. Which of the given wireless technologies used in IoT, consumes the least amount of power ?
(a) Zigbee (b) Bluetooth (c) Wi-Fi (d) GSM/CDMA

50. Which speed up could be achieved according to Amdahl's Law for infinite number of processes if 5% of a program is sequential and remaining part is ideally parallel ?
(a) Infinite (b) 5 (c) 20 (d) 50

PAPER : NOV. 2017

UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

PAPER-III

Note: This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are compulsory. The candidates are required to select the most appropriate answer of each question.

1. In 8085 microprocessor which of the following flag(s) is (are) affected by an arithmetic operation?
(a) AC flag only (b) CY flag only (c) Z flag only (d) AC, CY, Z flags

2. In 8085 microprocessor the address bus is of _____bits
(a) 4 (b) 8 (c) 16 (d) 32

3. In the architecture of 8085 microprocessor match the following

(A) Processing unit	(I) Interrupt
(B) Instruction unit	(II) General purpose Register
(C) Storage and Interface unit	(III) ALU
	(IV) Timing and Control

Code:

	A	B	C
(a)	IV	I	II
(b)	III	IV	II
(c)	II	III	I
(d)	I	II	IV

4. Which of the following addressing mode is best suited to access elements of an array of contiguous memory locations?
(a) Indexed addressing mode (b) Base register addressing mode
(c) Relative address mode (d) Displacement mode

5. Which of the following is CORRECT statement
(a) In memory-mapped I/O, the CPU can manipulate I/O data residing in interface registers that are not used to manipulate memory words
(b) The isolated I/O method isolates memory and I/O addresses so that memory address range is not affected by interface address assignment
(c) In asynchronous serial transfer of data the two units have a common clock
(d) In synchromous serial transmission data the two units have different clocks

6. A micro-instruction format has micro-ops field which is divided into three subfields F1, F2, F3 each having seven distinct micro-operations, condition field CD for four status bits, branch field BR having four options used in conjugation with address field ADF. The address space is is of 128 memory locations. The size of micro-instruction is
(a) 17 bits (b) 20 bits (c) 24 bits (d) 32 bits

7. Consider the following four schedules due to three transactions (indicated by the subscript) using read and write on a data item X, denoted by r(X) and w(X) respectively. Which one of them is conflict serializable?

$S_1 : r_1(X); r_2(X); w_1(X); r_3(X); w_2(X)$

$S_2 : r_2(X); r_1(X); w_2(X); r_3(X); w_1(x)$

$S_3 : r_3(X); r_2(X); r_1(X); w_2(X); w_1(X)$

$S_4 : r_2(X); w_2(X); r_3(X); r_1(X); w_1(X)$

(a) S_1 (b) S_2 (c) S_3 (d) S_4

8. Suppose a database schedule S involves transactions T_1, T_2, ...T_n. Consider the precedence graph of S with vertices representing the transactions and edges representing the conflicts. If S is serializable, which one of the following orderings of the vertices of the precedence graph is guaranteed to yield a serial schedule?
(a) Topological order (b) Depth-first order
(c) Breadh-first order (d) Ascending order of transaction indices

9. If every non-key attribute is functionally dependent on the primary key, then the relation is in
(a) first normal form (b) second normal form
(c) third normal form (d) fourth normal form

10. Consider a relation R(A, B, C, D, E, F, G, H), where each attribute is atomic, and the following functional dependencies exist.

$CH \rightarrow G$

$A \rightarrow BC$

$B \rightarrow CFH$

$E \rightarrow A$

$F \rightarrow EG$

The relation R is
(a) in 1NF but not in 3NF (b) in 2NF but not in 3NF
(c) in 3NF but not in BCNF (d) in BCNF

11. Given two relations R_1(A, B) and R_2(C, D), the result of following query
Select distinct A, B
from R_1, R_2
is guaranteed to be same as R_1 provided one of the following condition is satisfied
(a) R_1 has no duplicates and R_2 is empty
(b) R_1 has no duplicates and R_2 is non-empty
(c) Both R_1 and R_2 have no duplicates
(d) R_2 has no duplicates and R_1 is non-empty

12. Consider a schema R(A, B, C, D) and following functional dependencies

$A \rightarrow B$

$B \rightarrow C$

$C \rightarrow D$

$D \rightarrow B$

Then decomposition of R into R_1(A, B), R_2(B, C) and R_3(B, D) is
(a) Dependency preserving and lossless join
(b) Lossless join but not dependency preserving
(c) Dependency perserving but not lossless join
(d) Not dependency preserving and not lossless join

13. Which of the following is not a component of Memory tube display?
(a) Flooding gun (b) Collector (c) Ground (d) Liquid Crystal

14. Which of the following is not true in case of Oblique Projections?
(a) Parallel projection rays are not perpendicular to the viewing plane
(b) Parallel lines in space appear parallel on the final projected image
(c) used exclusively for pictorial purposes rather than formal working drawings
(d) Projectors are always perpendicular to the plane of projection

15. With respect to CRT, the horizontal retrace defined as
(a) The path an electron beam takes when returning to the left side of the CRT
(b) The path an electron beam takes when returning to the right side of the CRT
(c) The technique of turning the electron beam off while retracing
(d) The technique of turning the electron beam on/off while retracing

16. Find the equation of circle $x^2 + y^2 = 1$ in terms of $x'y'$ coordinates, assuming that the *xy* coordinate system results from a scaling of 3 units in the x' direction and 4 units in the y' direction

(a) $3(x')^2 + 4(y')^2 = 1$ (b) $\left(\frac{x'}{3}\right)^2 + \left(\frac{y'}{4}\right)^2 = 1$

(c) $(3x')^2 + (4y')^2 = 1$ (d) $\frac{1}{3}(x')^2 + \frac{1}{4}(y')^2 = 1$

17. Find the normalization transformation that maps a window whose lower left corner is at (1, 1) and upper right corner is at (3, 5) onto a viewport that is the entire normalized device screen

(a) $\begin{pmatrix} \frac{1}{2} & 0 & -\frac{1}{2} \\ 0 & \frac{1}{4} & -\frac{1}{4} \\ 0 & 0 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & -\frac{1}{4} & \frac{1}{4} \\ 1 & 1 & 1 \end{pmatrix}$ (c) $\begin{pmatrix} \frac{1}{2} & 0 & -\frac{1}{2} \\ 0 & \frac{1}{4} & \frac{1}{4} \\ 1 & 0 & 0 \end{pmatrix}$ (d) $\begin{pmatrix} \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & \frac{1}{4} & -\frac{1}{4} \\ 1 & 0 & 0 \end{pmatrix}$

18. The three aspects of Quantization, programmers generally concerned with are
(a) Coding error, sampling rate and Amplification
(b) Sampling rate, coding error and conditioning
(c) Sampling rate, aperture time and coding error
(d) Aperture time, coding error and strobing

19. The logic of pumping lemma is an example of
(a) iteration (b) recursion
(c) the divide and conquer principle (d) the pigeon - hole principle

20. Heap allocation is required for languages that
(a) use dynamic scope rules (b) support dynamic data structures
(c) support recursion (d) support recursion and dynamic data structures

21. Pumping lemma for regular language is generally used for proving
(a) whether two given regular expressions are equivalent
(b) a given grammar is ambiguous
(c) a given grammar is regular
(d) a given grammar is not regular

22. Which of the following problems is undecidable?
(a) To determine if two finite automata are equivalent
(b) Membership problem for context free grammar
(c) Finiteness problem for finite automata
(d) Ambiguity problem for context free grammar

23. Finite state machine can recognize language generated by
(a) only context free grammar (b) only context sensitive grammar
(c) only regular grammar (d) any unambiguous grammar

24. The language $L = \{a^i bc^i \mid i \geq 0\}$ over the alphabet {a, b, c} is
(a) a regular language
(b) not a deterministic context free language but a context free language
(c) recursive and is a deterministic context free language
(d) not recursive

25. Suppose we want to download text documents at the rate of 100 pages per second. Assume that a page consists of an average of 24 lines with 80 characters in each line. What is the required bit rate of the channel?
(a) 192 kbps (b) 512 kbps (c) 1.248 Mbps (d) 1.536 Mbps

26. Quadrature Amplitude Modulation means changing both
(a) Frequency and phase of the carrier (b) Frequency and Amplitude of the carrier
(c) Amplitude and phase of the carrier (d) Amplitude and wavelength of the carrier

27. If a file consisting of 50, 000 characters takes 40 seconds to send, then the data rate is
(a) 1 kbps (b) 1.25 kbps (c) 2 kbps (d) 10 kbps

28. Match the following

List-I	**List-II**
(A) Data link layer	(I) encryption
(B) Network layer	(II) connection control
(C) Transport layer	(III) routing
(D) Presentation layer	(IV) framing

Codes:

	A	B	C	D
(a)	IV	III	I	II
(b)	III	IV	II	I
(c)	IV	II	III	I
(d)	IV	III	II	I

29. The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and maximum number of hosts in each subnet?
(a) 62 subnets and 1022 hosts (b) 64 subnets and 1024 hosts
(c) 62 subnets and 254 hosts (d) 64 subnets and 256 hosts

30. Which of the following statements are true?
(I) The fragmentation fields in the base header section of IPv4 have moved to the fragmentation extension header in IPv6
(II) The authentication extension header is new in IPv6
(III) The record route option is not implemented in IPv6
(a) I and II only (b) II and III only (c) I and III only (d) I, II and III

31. Consider a full binary tree with n internal nodes, internal path length i, and external path length e. The internal path length of a full binary tree is the sum, taken over all nodes of the tree, of the depth of each node. Similarly, the external path length is the sum, taken over all leaves of the tree, of the depth of each leaf
Which of the following is correct for the full binary tree?
(a) e = i + n (b) e = i + 2n (c) e = 2i + n (d) $e = 2^n + i$

32. You are given a sequence of n elements to sort. The input sequence consists of $\frac{n}{k}$ subsequences, each containing k elements. The elements in a given subsequence are all smaller than the elements in the succeeding subsequence and larger than the elements in the preceding subsequence. Thus, all that is needed to sort the whole sequence of length n is to sort the k elements in each of the $\frac{n}{k}$ subsequences. The lower bound on the number of comparisions needed to solve this variant of the sorting problem is

(a) $\Omega(n)$ (b) $\Omega\left(\frac{n}{k}\right)$ (c) $\Omega(n\log k)$ (d) $\Omega\left(\frac{n}{k}\log\frac{n}{k}\right)$

33. Consider the recurrence relation :

$$T(n) = 8T\left(\frac{n}{2}\right) + Cn, \text{ if } n > 1$$
$$= b, \text{if } n = 1$$

where b and c are contants
The order of the algorithm corresponding to above recurrence relation is
(a) n (b) n^2 (c) nlogn (d) n^3

34. Consider the following two sequences

$X = \langle B, C, D, A, B, C \rangle$ and $Y = \langle C, A, D, B, C, B \rangle$

The length of longest common subsequence of X and Y is
(a) 5 (b) 3 (c) 4 (d) 2

35. A text is made up of the characters a, b, c, d, e each occuring with the probability 0.11, 0.40, 0.16, 0.09 and 0.24 respectively. The optimal Huffman coding technique will have the average length of
(a) 2.40 (b) 2.16 (c) 2.26 (d) 2.15

36. An undirected graph G(V, E) contains n (n > 2) nodes named v_1, v_2, ...v_n. Two nodes v_i nad v_j are connected if and only if $0 < |i - j| \le 2$. Each edge (v_i, v_j) is assigned a weight i + j. The cost of the minimum spanning tree of such a graph with 10 nodes is
(a) 88 (b) 91 (c) 49 (d) 21

37. An XML document that adderes to syntax rules specified by XML 1.0 specification in that it must satisfy both physical and logical structured, is called
(a) well-formed (b) reasonable (c) valid (d) spohisticated

38. Which of the following statement(s) is/are TRUE regarding Java Servelets?
(A) A Java Servelet is a server-side component that runs on the web server and extends the capabilities of a server
(B) A Servelet can use the user interface classes like AWT or Swing
Code:
(a) Only (A) is TRUE (b) Only (B) is TRUE
(c) Both (A) and (B) are TRUE (d) Neither (A) nor (B) is TRUE

39. Consider the following HTML table definition:

```
<table border = 1>
        <td colspan = 2> Text A </td>
    </tr>
    <tr>
        <td> Text B </td>
        <td> Text C </td>
    </tr>
    <tr>
        <td rowspan = 2> Text D </td>
        <td> Text E </td>
    </tr>
    <tr>
        <td> Text F </td>
    </tr>
    </table>
```

The above HTML code would render on screen as

(a)

Text A	
Text B	Text C
Text D	Text E
Text F	

(b)

Text A	Text B
Text C	
Text D	Text E
	Text F

(c)

Text A	
Text B	Text C
Text D	Text E
	Text F

(d)

Text A	
Text B	Text C
Text D	Text E
Text F	

40. Which of the following statements is/are TRUE?
(I) In HTML, character entities are used to incorporate external content into a web page, such as images
(II) Once a web server returns a cookie to a browser, the cookie will be included in all future requests from the browser to the same server
Code:
(a) Only (I) is TRUE
(b) Only (II) is TRUE
(c) Both (I) and (II) are TRUE
(d) Neither (I) nor (II) is TRUE

41. Which of the following statements is/are TRUE regarding JAVA?
(A) Constants that cannot be changed are declared using the 'static' keyword
(B) A class can only inherit one class but can implement multiple interfaces
Code:
(a) Only (A) is TRUE
(b) Only (B) is TRUE
(c) Both (I) and (II) are TRUE
(d) Neither (I) nor (II) is TRUE

42. What is the output of the following JAVA program?

```
Class Test
{
    public static void main (String [ ] args)
    {
        Test obj = new Test ( );
```

```
        obj.start ( );
    }
    void start ( )
    {
        String stra = "do";
        String strb = method (stra);
        System.out.print (":" + stra + strb);
    }
    String method (String data)
    {
        stra = stra + "good";
        System.out.print (stra);
        return "good";
        }
    }
```

(a) dogood : dogoodgood (b) dogood : gooddogood
(c) dogood : dodogood (d) dogood : dogood

43. Statistical software quality assurance in software engineering involves
(a) using sampling in place of exhaustive testing of software
(b) surveying customers to find out their opinions about product quality
(c) tracing each defect to its underlying cause, isolating the vital few causes, and moving to correct them.
(d) tracing each defect to its underlying causes, and using the Pareto principle to correct each problem found.

44. Which of the following statements is/are FALSE with respect to software testing?
S1 : White-box tests are based on specifications; better at telling whether program meets specification, better at finding errors of ommission
S2 : Black-box tests are based on code; better for finding crashes, out of bounds errors, file not closed errores
S3 : Alpha testing is conducted at the developers site by a team of highly skilled testers for software that is developed as a product to be used by many customers.
(a) only S1 and S2 are FALSE (b) only S1 and S3 are FALSE
(c) only S2 and S3 are FALSE (d) All of S1, S2 and S3 are FALSE

45. A signal processor software is expected to operate for 91.25 days after repair, and the mean software repair time is expected to be 5 minutes. Then, the availability of the software is
(a) 96.9862 % (b) 97.9862% (c) 98.9962% (d) 99.9962%

46. Consider the method mcq ( ):

```
    int mcq (boolean a, boolean b, boolean c, boolean d)
    {
        int ans = 1;
        if (a) {ans = 2; }
        else if (b) {ans = 3;}
        else if (c) {
            if (d) {ans = 4;}
        return ans;
    }
```

If
M1 = Number of tests to exhaustively test mcq ( );
M2 = Minimum number of tests to achieve full statement coverage for mcq ( ); and
M3 = Minimum number of tests to achieve full branch coverage for mcq ( );
then (M1, M2, M3) =
(a) (16, 3, 5) (b) (8, 5, 3) (c) (8, 3, 5) (d) (16, 4, 4)

47. A simple stand - alone software utility is to be developed in 'C' programming by a team of software experts for a computer running Linux and the overall size of this software is estimated to be 20, 000 lines of code. Considering (a, b) = (2.4, 1.05) as multiplicative and exponention factor for the basic COCOMO effort estimation equation and (c, d) = (2.5, 0.38) as multiplicative and exponention factor for the basic COCOMO development time estimation equation, approximately how long does the software project take to complete?
(a) 10.52 months (b) 11.52 months (c) 12.52 months (d) 14.52 months

48. In software Configuration Management (SCM), which of the following is a use-case supported by standard version control systems?
(I) Managing several versions or releases of a software
(II) Filing bug reports and tracking their progress
(III) Allowing team members to work in parallel
(IV) Identifying when and where a regression occurred
Code:
(a) Only (I), (III) and (IV) (b) Only (I), (II) and (III)
(c) Only (I), (II) and (IV) (d) Only (II), (III) and (IV)

49. Consider the following four processes with the arrival time and length of CPU burst given in milli-seconds:

Process	**Arrival Time**	**Burst Time**
P1	0	8
P2	1	4
P3	2	9
P4	3	5

The average waiting time or preemptive SJF scheduling algorithm is
(a) 6.5 ms (b) 7.5 ms (c) 6.75 ms (d) 7.75 ms

50. Consider a virtual page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Suppose a demand virtual memory system running on a computer system such that the main memory has 3 page frames. Then _____page replacement algorithm has minimum number of page faults
(a) FIFO (b) LIFO (c) LRU (d) Optimal

51. Use level threads are threads that are visible to the programmar and are unknown to the kernel. The operating system kernel supports and manages kernel level threads. Three different types of models relate user and kernel level threads
Which of the following statements is/are true?
(A) (i) The many-to-one model maps many user threads to one kernel thread
(ii) The one-to-one model maps one user thread to one kernel thread
(iii) The many-to-many model maps many user threads to smaller or equal kernel threads
(B) (i) Many-to-one model maps many kernel threads to one user thread
(ii) One-to-one model maps one kernel thread to one user thread
(iii) Many-to-many model maps many kernel threads to smaller or equal user threads
Code :
(a) (A) is true ; (B) is false (b) (A) is false; (B) is false
(c) both (A) and (B) are true (d) both (A) and (B) are false

52. Consider a system with five processes P_0 through P_4 and three resource types A, B and C. Resource type A has seven instances, resource type B has two instances and resource type C has six instances suppose at time T_0 we have the following allocation.

Process	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	1	0	0	0	0	0	0	0
P_1	2	0	0	2	0	2			
P_2	3	0	3	0	0	0			
P_3	2	1	1	1	0	0			
P_4	0	2	2	0	0	2			

If we implement Deadlock detection algorithm we claim that system is _____
(a) Semaphore (b) Deadlock state (c) Circular wait (d) Not in deadlock state

53. Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67. Suppose SSTF disk scheduling algorithm implemented to meet the requests then the total number of head movements are _____if the disk head is initially at 53.
(a) 224 (b) 248 (c) 236 (d) 240

54. The bounded buffer problem is also known as
(a) producer-consumer problem (b) Reader-writer problem
(c) Dining Philosophers problem (d) Both (b) and (c)

55. In Artificial Intelligene (AI), which agent deals with happy and unhappy state?
(a) Simple reflex agent (b) Model based agent
(c) Learning agent (d) Utility based agent

56. If b is the branching factor and m is the maximum depth of the search tree, what is the space complexity of greedy search?
(a) O(b + m) (b) O (bm) (c) $O(b^m)$ (d) $O(m^b)$

57. Let P, Q, R and S be Propositions. Assume that the equivalence $P \Leftrightarrow (Q \vee \neg Q)$ and $Q \Leftrightarrow R$ hold. Then the truth value of the formula $(P \wedge Q) \Rightarrow ((P \wedge R) \vee S)$ is always
(a) True (b) False
(c) Same as truth table of Q (d) Same as truth table of S

58. "If X, then Y unless Z" is represented by which of the following formula in proportional logic?
(a) $(X \wedge Y) \rightarrow \neg Z$ (b) $(X \wedge \neg Z) \rightarrow Y$
(c) $X \rightarrow (Y \wedge \neg Z)$ (d) $Y \rightarrow (X \wedge \neg Z)$

59. Consider the following two well-formed formula in prepositional logic

$$F1 : P \Rightarrow \neg P$$

$$F2 : (P \Rightarrow \neg P) \vee (\neg P \Rightarrow P)$$

Which of the following statements is correct?
(a) F1 is satisfiable, F2 is valid (b) F1 is unsatisfiable, F2 is satisfiable
(c) F1 is unsatisfiable, F2 is valid (d) F1 and F2 both are satisfiable

60. Standard planning algorithms assume environment to be
(a) Both deterministic and fully observable (b) Neither deterministic nor fully observable
(c) Deterministic but not fully observable (d) Not deterministic but fully observable

61. Which of the following statements is not correct?
(a) Every recursive language is recursively enumerable
(b) $L = \{0^n 1^n 0^n \mid n = 1, 2, 3, ...\}$ is recursively enumerable
(c) Recursive languages are closed under interaction
(d) Recursive langauges are not closed under intersection

62. Context free grammar is not closed under
(a) Concatenation (b) Complementation (c) Kleene Star (d) Union

63. Consider the following languages:

$L_1 = \{a^m b^n \mid m \neq n\}$; $L_2 = \{a^m b^n \mid m = 2n+1\}$; $L_3 = \{a^m b^n \mid m \neq 2n\}$

Which one of the following statement is correct?
(a) Only L_1 and L_2 are context free languages(b) Only L_1 and L_3 are context free languages
(c) Only L_2 and L_3 are context free languages(d) L_1, L_2 and L_3 are context free languages

64. A 4×4 DFT matrix is given by

$$\frac{1}{2}\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & x & -1 & y \\ 1 & -1 & 1 & -1 \\ 1 & -j & -1 & j \end{bmatrix} \quad \left(j^2 = -1\right)$$

where values of x and y are _____, _____ respectively.
(a) 1, –1 (b) –1, 1 (c) –j, j (d) j, – j

65. Entropy of a discrete random variable with possile values $\{x_1, x_2, ..., x_n\}$ and probability density function $P(x)$ is

$$H(X) = -\sum_{i=1}^{n} P(x_i) \log_b P(x_i)$$

The value of b gives the units of entropy. The unit for b = 10 is
(a) bits (b) bann (c) nats (d) deca

66. For any binary (n, h) linear code with minimum distance (2t + 1) or greater $n - h \geq \log_2 \left[\sum_{i=0}^{\alpha} \binom{n}{i}\right]$

where α is
(a) 2t + 1 (b) t + 1 (c) t – 1 (d) t

67. Which of the following is a valid reason for causing degeneracy in a transportation problem? Here m is number of rows and n is number of columns in transportation table
(a) When the number of allocations is m + n –1
(b) When two or more occupied cells become unoccupied simultaneously
(c) When the number of allocations is less than m + n –1
(d) When a loop cannot be drawn without using unoccupied cells, except the starting cell of the loop

68. Consider the following LPP

$Max\ \ Z = 15x_1 + 10x_2$

Subject to the constraints

$4x_1 + 6x_2 \le 360$

$3x_1 + 0x_2 \le 180$

$0x_1 + 5x_2 \le 200$

$x_1, x_2 \ge 0$

The solution of the LPP using Graphical solution technique is

(a) $x_1 = 60,\ x_2 = 0$ and $Z = 900$ (b) $x_1 = 60,\ x_2 = 20$ and $Z = 1100$

(c) $x_1 = 60,\ x_2 = 30$ and $Z = 1200$ (d) $x_1 = 50,\ x_2 = 40$ and $Z = 1150$

69. Consider the following LPP:

Min $Z = 2x_1 + x_2 + 3x_3$

Subject to :

$x_1 - 2x_2 + x_3 \ge 4$

$2x_1 + x_2 + x_3 \le 8$

$x_1 - x_3 \ge 0$

$x_1, x_2, x_3 \ge 0$

The solution of this LPP using Dual Simplex Method is

(a) $x_1 = 0,\ x_2 = 0,\ x_3 = 3$ and $Z = 9$ (b) $x_1 = 0,\ x_2 = 6,\ x_3 = 0$ and $Z = 6$

(c) $x_1 = 4,\ x_2 = 0,\ x_3 = 0$ and $Z = 8$ (d) $x_1 = 2,\ x_2 = 0,\ x_3 = 2$ and $Z = 10$

70. Consider a Takagi-Sugeno-Kang (TSK) Model consisting of rules of the form:

If x_1 is A_{i1} and ..... and x_r is A_{ir}

THEN $y = f_i(x_1, x_2, ..., x_r) = b_{i0} + b_{i1}x_1 + ... + b_{ir}x_r$

assume, α_i is the matching degree of rule *i*, then the total output of the model is given by

(a) $y = \sum_{i=1}^{L} \alpha_i f_i(x_1, x_2, ..., x_r)$ (b) $y = \dfrac{\sum_{i=1}^{L} \alpha_i f_i(x_1, x_2, ..., x_r)}{\sum_{i=1}^{L} \alpha_i}$

(c) $y = \dfrac{\sum_{i=1}^{L} f_i(x_1, x_2, ..., x_r)}{\sum_{i=1}^{L} \alpha_i}$ (d) $y = \max_i \left[\alpha_i f_i(x_1, x_2, ...x_r)\right]$

71. Consider a single perceptron with sign activation function. The perceptron is represented weight vector [0.4–0.3 0.1]^t and a bias $\theta = 0$. If the input vector to the perceptron is X = [0.2 0.6 0.5] then the output of the perceptron is :

(a) 1 (b) 0 (c) –0.05 (d) –3

72. The Sigmoid activation function $f(t)$ is defined as

(a) $\frac{1}{\exp(t)+\exp(-t)}$ (b) $t\exp(-t)$ (c) $\frac{1}{1+\exp(t)}$ (d) $\frac{1}{1+\exp(-t)}$

73. Consider the following statements
(A) UNIX provides three types of permissions
* Read
* Write
* Execute
(B) UNIX provides three sets of permissions
* permission for owner
* permission for group
* permission for others
Which of the above statement/s is/are true?
(a) Only (A) (b) Only (B) (c) Both (A) and (B) (d) Neither (A) nor (B)

74. Which of the following routing technique / techniques is/ are used in distributed systems?
(I) Fixed Routing (II) Virtual Routing (III) Dynamic Routing
Code:
(a) I only (b) I and II only (c) III only (d) All I, II, III

75. Match the following WINIDOWS system calls and UNIX system calls with reference to process control and File manipulation

WINDOWS	**UNIX**
(A) Create-process ( )	(I) Open ( )
(B) WaitForSingleObject ( )	(II) Close ( )
(C) CreateFile ( )	(III) Fork ( )
(D) CloseHandle ( )	(IV) Wait ( )

Codes :

	A	**B**	**C**	**D**
(a)	III	IV	I	II
(b)	IV	III	I	II
(c)	IV	III	II	I
(d)	III	IV	II	I