PAPER : JAN. 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. Consider a sequence F_{00} defined as:

$$F_{00}(0)=1, F_{00}(1)=1$$

$$F_{00}(n)=\frac{10*F_{00}(n-1)+100}{F_{00}(n-2)} \text{ for } n \geq 2$$

Then what shall be the set of values of the sequence F_{00} ?

(a) (1, 110, 1200) (b) (1, 110, 600, 1200)
(c) (1, 2, 55, 110, 600, 1200) (d) (1, 55, 110, 600, 1200)

2. Match the following :

List - I	List - II
A. Absurd	i. Clearly impossible being contrary to some evident truth.
B. Ambiguous	ii. Capable of more than one interpretation or meaning.
C. Axiom	iii. An assertion that is accepted and used without a proof.
D. Conjecture	iv. An opinion preferably based on some experience or wisdom.

Codes:

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

3. The functions mapping R into R are defined as :

$$f(x)=x^3-4x, g(x)=\frac{1}{x^2+1} \text{ and } h(x)=x^4.$$

Then find the value of the following composite functions:

$$h \circ g(x) \text{ and } h \circ g \circ f(x)$$

(a) $(x^2+1)^4$ and $\left[(x^3-4x)^2+1\right]^4$ (b) $(x^2+1)^4$ and $\left[(x^3-4x)^2+1\right]^{-4}$

(c) $(x^2+1)^{-4}$ and $\left[(x^2-4x)^2+1\right]^4$ (d) $(x^2+1)^{-4}$ and $\left[(x^3-4x)^2+1\right]^{-4}$

4. How many multiples of 6 are there between the following pairs of numbers ?

0 and 100 and –6 and 34

(a) 16 and 6 (b) 17 and 6 (c) 17 and 7 (d) 16 and 7

5. Consider a Hamiltonian Graph G with no loops or parallel edges and with $|V(G)| = n \geq 3$. Then which of the following is true?

(a) $\deg(v) \geq \frac{n}{2}$ for each vertex v.

(b) $|E(G)| \geq \frac{1}{2}(n-1)(n-2)+2$

(c) $\deg(v) + \deg(w) \geq n$ whenever v and w are not connected by an edge.

(d) All of the above

6. In propositional logic if $(P \to Q) \wedge (R \to S)$ and $(P \vee R)$ are two premises such that

$$\frac{(P \to Q) \wedge (R \to S)}{P \vee R}$$
$$\overline{\qquad Y \qquad}$$

Y is the premise :

(a) $P \vee R$ (b) $P \vee S$ (c) $Q \vee R$ (d) $Q \vee S$

7. ECL is the fastest of all logic families. High speed in ECL is possible because transistors are used in difference amplifier configuration, in which they are never driven into _____.

(a) Race condition (b) Saturation (c) Delay (d) High impedance

8. A binary 3-bit down counter uses J-K flip-flops, FF_i with inputs J_i, K_i and outputs Q_i, i = 0, 1, 2 respectively. The minimized expression for the input from following, is

I. $J_0 = K_0 = 0$

II. $J_0 = K_0 = 1$

III. $J_1 = K_1 = Q_0$

IV. $J_1 = K_1 = \overline{Q}_0$

V. $J_2 = K_2 = Q_1 Q_0$

VI. $J_2 = K_2 = \overline{Q}_1 \overline{Q}_0$

(a) I, III, V (b) I, IV, VI (c) II, III, V (d) II, IV, VI

9. Convert the octal number 0.4051 into its equivalent decimal number.

(a) 0.5100098 (b) 0.2096 (c) 0.52 (d) 0.4192

10. The hexadecimal equivalent of the octal number 2357 is :

(a) 2EE (b) 2FF (c) 4EF (d) 4FE

11. Which of the following cannot be passed to a function in C++ ?

(a) Constant (b) Structure (c) Array (d) Header file

12. Which one of the following is correct for overloaded functions in C++ ?

(a) Compiler sets up a separate function for every definition of function.

(b) Compiler does not set up a separate function for every definition of function.

(c) Overloaded functions cannot handle different types of objects.

(d) Overloaded functions cannot have same number of arguments

13. Which of the following storage classes have global visibility in C/C++ ?
(a) Auto (b) Extern (c) Static (d) Register

14. Which of the following operators cannot be overloaded in C/C++ ?
(a) Bitwise right shift assignment (b) Address of
(c) Indirection (d) Structure reference

15. If X is a binary number which is power of 2, then the value of X and (X –1) is :
(a) 11.....11 (b) 00.....00 (c) 100.....0 (d) 000.....1

16. An attribute A of datatype varchar (20) has value 'Ram' and the attribute B of datatype char (20) has value 'Sita' in oracle. The attribute A has _____ memory space and B has _____ memory spaces.
(a) 20, 20 (b) 3, 20 (c) 3, 4 (d) 20, 4

17. Integrity constraints ensure that changes made to the database by authorized users do not result into loss of data consistency. Which of the following statement(s) is (are) true w.r.t. the examples of integrity constraints?
(A) An instructor Id. No. cannot be null, provided Intructor Id No. being primary key.
(B) No two citizens have same Adhar-Id.
(C) Budget of a company must be zero.
(a) (A), (B) and (C) are true (b) (A) false, (B) and (C) are true
(c) (A) and (B) are true; (C) false (d) (A), (B) and (C) are false

18. Let M and N be two entities in a E-R diagram with simple single value attributes. R_1 and R_2 are two relationship between M and N. where as
R_1 is one-to-many and R_2 is many-to-many.
The minimum number of tables required to represent M, N, R_1 and R_2 in the relational model are _____.
(a) 4 (b) 6 (c) 7 (d) 3

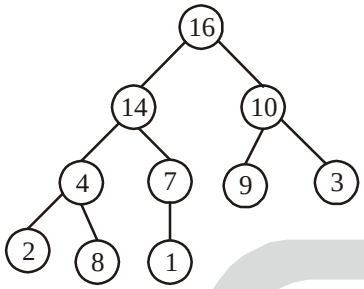
19. Consider a schema R(MNPQ) and functional dependencies $M \rightarrow N$, $P \rightarrow Q$. Then the decomposition of R into $R_1(MN)$ and $R_2(PQ)$ is _____.
(a) Dependency preserving but not lossless join
(b) Dependency preserving and lossless join
(c) Lossless join but not dependency preserving
(d) Neither dependency preserving nor lossless join.

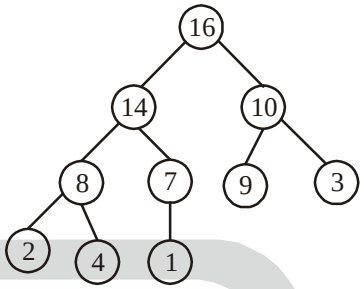
20. The order of a leaf node in a B^+ tree is the maximum number of children it can have. Suppose that block size is 1 kilobytes, the child pointer takes 7 bytes long and search field value takes 14 bytes long. The order of the leaf node is _____.
(a) 16 (b) 63 (c) 64 (d) 65

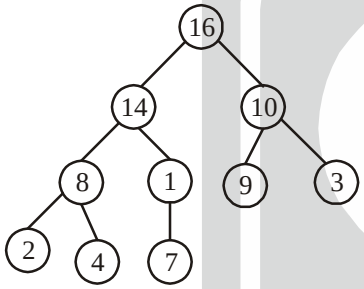
21. Which of the following is true for computation time in insertion, deletion and finding maximum and minimum element in a sorted array ?
(a) Insertion – 0(1), Deletion – 0(1), Maximum – 0(1), Minimum – 0(1)
(b) Insertion –0(1), Deletion – 0(1), Maximum – 0(n), Minimum – 0(n)
(c) Insertion –0(n), Deletion – 0(n), Maximum – 0(1), Minimum – 0(1)
(d) Insertion –0(n), Deletion – 0(n), Maximum – 0(n), Minimum – 0(n)

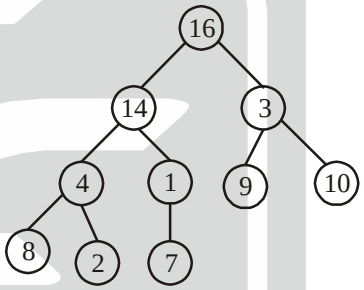
22. The seven elements A, B, C, D, E, f and G are pushed onto a stack in reverse order, i.e., starting from G. The stack is popped five times and each element is inserted into a queue. Two elements are deleted from the queue and pushed back onto the stack. Now, one element is popped from the stack. The popped item is _____.
(a) A (b) B (c) F (d) G

23. Which of the following is a valid heap ?

(A) 

(B) 

(C) 

(d) 

(a) A (b) B (c) C (d) D

24. If h is chosen from a universal collection of hash functions and is used to hash n keys into a table of size m, where $n \leq m$, the expected number of collisions involving a particular key x is less than _____.
(a) 1 (b) 1/n (c) 1/m (d) n/m

25. Which of the following statements is false?
(A) Optimal binary search tree construction can be performed efficiently using dynamic programming.
(B) Breadth-first search cannot be used to find connected components of a graph.
(C) Given the prefix and postfix walks of a binary tree, the tree cannot be re-constructed uniquely.
(D) Depth-first-search can be used to find the connected components of a graph.
(a) A (b) B (c) C (d) D

26. Match the following Layers and Protocols for a user browsing with SSL :

A. Application of layer	i. TCP
B. Transport layer	ii. IP
C. Network layer	iii. PPP
D. Datalink layer	iv. HTTP

Codes:
(a) A-iv, B-i, C-ii, D-iii (b) A-iii, B-ii, C-i, D-iv
(c) A-ii, B-iii, C-iv, D-i (d) A-iii, B-i, C-iv, D-ii

27. The maximum size of the data that the application layer can pass on to the TCP layer below is _____.
(a) 2^{16} bytes (b) 2^{16} bytes + TCP header length
(c) 2^{16} bytes – TCP header length (d) 2^{15} bytes

28. A packet whose destination is outside the local TCP/IP network segment is sent to _____.
(a) File server (b) DNS server (c) DHCP server (d) Default gateway

29. Distance vector routing algorithm is a dynamic routing algorithm. The routing tables in distance vector routing algorithm are updated _____.
(a) automatically
(b) by server
(c) by exchanging information with neighbour nodes
(d) with back up database

30. In link state routing algorithm after construction of link state packets, new routes are computed using :
(a) DES algorithm (b) Dijkstra's algorithm
(c) RSA algorithm (d) Packets

31. Which of the following strings would match the regular expression : $p+[3-5]*[xyz]$?
I. p443y II. p6y III. 3xyz IV. p35z
V. p353535x VI. ppp5
(a) I, III and VI only (b) IV, V and VI only (c) II, IV and V only (d) I, IV and V only

32. Consider the following assembly language instructions :
```
mov al, 15
mov ah, 15
xor al, al
mov cl, 3
shr ax, cl
add al, 90H
adc ah, 0
```
What is the value in ax register after execution of above instructions ?
(a) 0270H (b) 0170H (c) 01E0H (d) 0370H

33. Consider the following statements related to compiler construction :
I. Lexical Analysis is specified by context-free grammars and implemented by pushdown automata.
II. Syntax Analysis is specified by regular expressions and implemented by finite-state machine.
Which of the above statement(s) is/are correct ?
(a) Only I (b) Only II (c) Both I and II (d) Neither I nor II

34. The contents of Register (BL) and Register (AL) of 8085 microprocessor are 49H and 3AH respectively. The contents of AL, the status of carry flag (CF) and sign flag (SF) after executing 'SUB AL, BL' assembly language instruction, are
(a) AL = 0FH; CF = 1; SF = 1 (b) AL = F0H; CF = 0; SF = 0
(c) AL = F1H; CF = 1; SF = 1 (d) AL = 1FH; CF = 1; SF = 1

35. Which of the following statement(s) regarding a linker software is/are true ?
I. A function of a linker is to combine several object modules into a single load module.
II. A function of a linker is to replace absolute references in an object module by symbolic references to locations in other modules.
(a) Only I (b) Only II (c) Both I and II (d) Neither I nor II

36. There are three processes P_1, P_2 and P_3 sharing a semaphore for synchronizing a variable. Initial value of semaphore is one. Assume that negative value of semaphore tells us how many processes are waiting in queue. Processes access the semaphore in following order :
(A) P2 needs to access (B) P1 needs to access
(C) P3 needs to access (D) P2 exits critical section
(E) P1 exits critical section
The final value of semaphore will be :
(a) 0 (b) 1 (c) –1 (d) –2

37. In a paging system, it takes 30 ns to search translation Look-a-side Buffer (TLB) and 90 ns to access the main memory. If the TLB hit ratio is 70%, the effective memory access time is :
(a) 48ns (b) 147ns (c) 120ns (d) 84ns

38. Match the following w.r.t. Input/Output management :

List - I	**List - II**
A. Device controller	i. Extracts information from the controller register and store it in data buffer
B. Device driver	ii. I/O scheduling
C. Interrupt handler	iii. Performs data transfer
D. Kernel I/O subsystem	iv. Processing of I/O request

Codes :
(a) A-iii, B-iv, C-i, D-ii (b) A-ii, B-i, C-iv, D-iii
(c) A-iv, B-i, C-ii, D-iii (d) A-i, B-iii, C-iv, D-ii

39. Which of the following scheduling algorithms may cause starvation ?
(A) First-come-first-served (B) Round Robin
(C) Priority (D) Shortest process next
(E) Shortest remaining time first
(a) A, C and E (b) C, D and E (c) B, D and E (d) B, C and D

40. Distributed operating systems consist of :
(a) Loosely coupled O.S. software on a loosely coupled hardware.
(b) Loosely coupled O.S. software on a tightly coupled hardware.
(c) Tightly coupled O.S. software on a loosely coupled hardware.
(d) Tightly coupled O.S. software on a tightly coupled hardware.

41. Software Engineering is an engineering discipline that is concerned with:
(a) how computer systems work.
(b) theories and methods that underlie computers and software systems.
(c) all aspects of software production.
(d) all aspects of computer-based systems developement, including hardware, software and process engineering.

42. Which of the following is not one of three software product aspects addressed by McCall's software quality factors ?
(a) Ability to undergo change (b) Adaptiability to new environments
(c) Operational characteristics (d) Production costs and scheduling

43. Which of the following statement(s) is/are true with respect to software architecture ?
S1: Coupling is a measure of how well the things grouped together in a module belong together logically.
S2: Cohesion is a measure of the degree of interaction between software modules.
S3: If coupling is low and cohesion is high then it is easier to change one module without affecting others.
(a) Only S1 and S2 (b) Only S3 (c) All of S1, S2 and S3 (d) Only S1

44. The prototyping model of software development is :
(a) a reasonable approach when requirements are well-defined.
(b) a useful approach when a customer cannot define requirements clearly.
(c) the best approach to use for projects with large developement teams.
(d) a risky model that rarely produces a meaningful product.

45. A software design pattern used to enhance the functionality of an object at run-time is:
(a) Adapter (b) Decorator (c) Delegation (d) Proxy

46. Match the following :

List - I	**List - II**
A. Affiliate Marketing	i. Vendors ask partners to place logos on partner's site. If customers click, come to vendors and buy.
B. Viral Marketing	ii. Spread your brand on the net by word-of-mouth. Receivers will send your information to their friends.
C. Group Purchasing	iii. Aggregating the demands of small buyers to get a large volume. Then negotiate a price.
D. Bartering Online	iv. Exchanging surplus products and services with the process administered completely online by an intermediary. Company receives "points" for its contribution.

Codes :
(a) A-i, B-ii, C-iii, D-iv (b) A-i, B-iii, C-ii, D-iv
(c) A-iii, B-ii, C-iv, D-i (d) A-ii, B-iii, C-i, D-iv

47. _____ refers loosely to the process of semi-automatically analyzing large databases to find useful patterns.
(a) Datamining (b) Data warehousing (c) DBMS (d) Data mirroring

48. Which of the following is/are true w.r.t. applications of mobile computing ?
(A) Travelling of salesman
(B) Location awareness services
(a) (A) true; (B) false (b) Both (A) and (B) are true
(c) Both (A) and (B) are false (d) (A) false; (B) true

49. In 3G network, W-CDMA is also known as UMTS. The minimum spectrum allocation required for W-CDMA is _____.
(a) 2 MHz (b) 20 KHz (c) 5 KHz (d) 5 MHz

50. Which of the following statements is/are true w.r.t. Enterprise Resource Planning (ERP) ?
(A) ERP automates and integrates majority of business processes.
(B) ERP provides access to information in a Real Time Environment.
(C) ERP is inexpensive to implement.
(a) (A), (B) and (C) are false (b) (A) and (B) false; (C) true
(c) (A) and (B) true; (C) false (d) (A) true; (B) and (C) are false.

PAPER : JAN. 2017

UGC-NET COMPUTER SCIENCE & APPLICATIONS (87)

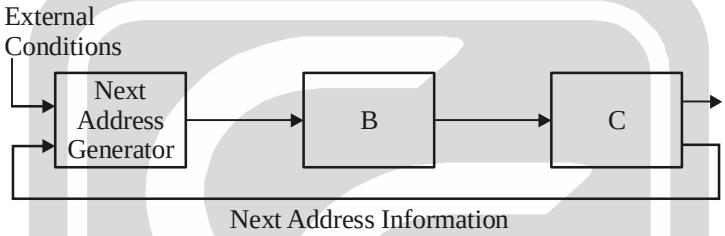
PAPER-III

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. Which of the following is an interrupt according to temporal relationship with system clock ?
(a) Maskable interrupt (b) Periodic interrupt (c) Division by zero (d) Synchronous interrupt

2. Which of the following is incorrect for virtual memory ?
(a) Large programs can be written (b) More I/O is required
(c) More addressable memory available (d) Faster and easy swapping of process

3. The general configuration of the microprogrammed control unit is given below :



What are blocks B and C in the diagram respectively ?
(a) Block address register and cache memory
(b) Control address register and control memory
(c) Branch register and cache memory
(d) Control address register and random access memory

4. Match the following :

Addressing Mode	**Location of Operand**
A. Implied	i. Registers which are in CPU
B. Immediate	ii. Register specifies the address of the operand.
C. Register	iii. Specified in the register
D. Register Indirect	iv. Specified implicitly in the definition of instruction

Codes :
(a) A-iv, B-iii, C-i, D-ii (b) A-iv, B-i, C-iii, D-ii
(c) A-iv, B-ii, C-i, D-iii (d) A-iv, B-iii, C-ii, D-i

5. In 8085 microprocessor, the digit 5 indicates that the microprocessor needs
(a) –5 volts, +5 volts supply (b) +5 volts supply only
(c) –5 volts supply only (d) 5 MHz clock

6. In 8085, which of the following performs : load register pair immediate operation ?
(a) LDAX rp (b) LHLD addr (c) LXI rp, data (d) INX rp

7. Consider following schedules involving two transactions :
$S_1 : r_1(X); r_1(Y); r_2(X); r_2(Y); w_2(Y); w_1(X)$
$S_2 : r_1(X); r_2(X); r_2(Y); w_2(Y); r_1(Y); w_1(X)$
Which of the following statement is true ?
(a) Both S_1 and S_2 are conflict serializable.
(b) S_1 is conflict serializable and S_2 is not conflict serializable.
(c) S_1 is not conflict serializable and S_2 is conflict serializable.
(d) Both S_1 and S_2 are not conflict serializable.

8. Which one is correct w.r.t. RDBMS ?
(a) primary key $\subseteq$ super key $\subseteq$ candidate key
(b) primary key $\subseteq$ candidate key $\subseteq$ super key
(c) super key $\subseteq$ candidate key $\subseteq$ primary key
(d) super key $\subseteq$ primary key $\subseteq$ candidate dey

9. Let pk(R) denotes primary key of relation R. A many-to-one relationship that exists between two relations R_1 and R_2 can be expressed as follows :

(a) $pk(R_2) \rightarrow pk(R_1)$ (b) $pk(R_1) \rightarrow pk(R_2)$

(c) $pk(R_2) \rightarrow R_1 \cap R_2$ (d) $pk(R_1) \rightarrow R_1 \cap R_2$

10. For a database relation R(A, B, C, D) where the domains of A, B, C and D include only atomic values, only the following functional dependencies and those that can be inferred from them are :

$A \rightarrow C$

$B \rightarrow D$

The relation R is in _____.
(a) First normal form but not in second normal form.
(b) Both in first normal form as well as in second normal form.
(c) Second normal form but not in third normal form.
(d) Both in second normal form as well as in third normal form.

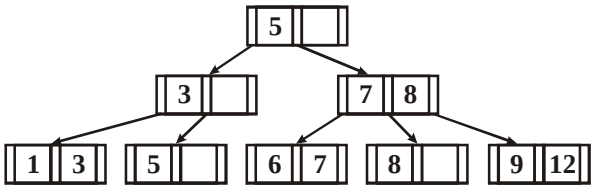
11. Consider the following relation :
Works (emp_name, company_name, salary)
Here, emp_name is primary key.
Consider the following SQL query

```
Select emp_name
From works T
where salary > (select avg (salary)
                from works S
                 where T.company _ name =
                       S.company _ name)
```

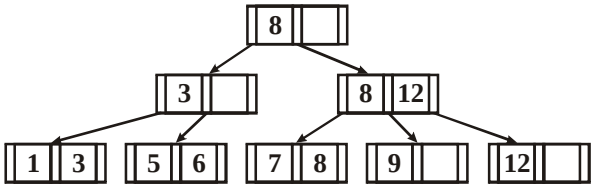
The above query is for following :
(a) Find the highest paid employee who earns more than the average salary of all employees of his comapny.
(b) Find the highest paid employee who earns more than the average salary of all the employees of all the companies.
(c) Find all employees who earn more than the average salary of all employees of all the companies.
(d) Find all employees who earn more than the average salary of all employees of their company.

12. If following sequence of keys are inserted in a B^+ tree with K(=3) pointers :
8, 5, 1, 7, 3, 12, 9, 6
Which of the following shall be correct B^+ tree ?

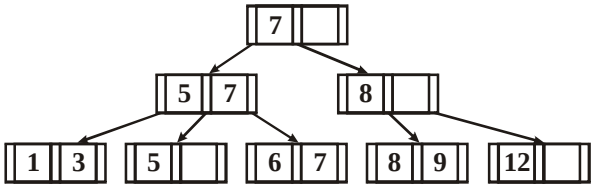
(a)



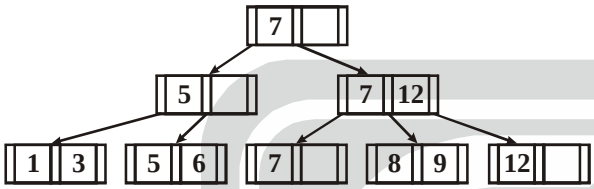
(b)



(c)



(d)



13. Which of the following statement(s) is/are correct ?
(a) Persistence is the term used to describe the duration of phosphorescence.
(b) The control electrode is used to turn the electron beam on and off.
(c) The electron gun creates a source of electrons which are focussed into a narrow beam directed at the face of CRT.
(d) All of the above

14. A segment is any object described by GKS commands and data that with CREATE SEGMENT and Terminates with CLOSE SEGMENT command. What functions can be perfomed on these segments ?
(a) Translation and Rotation
(b) Panning and Zooming
(c) Scaling and Shearing
(d) Translation, Rotation, Panning and Zooming

15. Match the following :

A. Glass	i. Contains liquid crystal and serves as a bonding surface for a conductive coating
B. Conductive coating	ii. Acts as a conductor so that a voltage can be applied across the liquid crystal.
C. Liquid crystal	iii. A substance which will polarize light when a voltage is applied to it.
D. Polarized film	iv. A transparent sheet that polarizes light.

Codes :

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

16. Below are the few steps given for scan-converting a circle using Bresenham's Algorithm. Which of the given steps is not correct ?
(a) Compute d = 3 – 2r (where r is radius)
(b) Stop if x > y
(c) If d < 0, then d = 4x + 6 and x = x + 1
(d) If $d \geq 0$, then d – 4 * (x – y) + 10, x = x + 1 and y = y + 1

17. Which of the following is/are side effects of scan conversion ?
(A) Aliasing
(B) Unequal intensity of diagonal lines
(C) Overstriking in photographic applications
(D) Local or Global aliasing
(a) (A) and (B) (b) (A), (B) and (C) (c) (A), (C) and (D) (d) (A), (B), (C) and (D)

18. Consider a line AB with A = (0, 0) and B = (8, 4). Apply a simple DDA algorithm and compute the first four plots on this line.
(a) [(0, 0), (1, 1), (2, 1), (3, 2)]
(b) [(0, 0), (1, 1.5), (2, 2), (3, 3)]
(c) [(0, 0), (1, 1), (2, 2.5), (3, 3)]
(d) [(0, 0), (1, 2), (2, 2), (3, 2)]

19. Which of the following are not regular ?
(A) Strings of even number of a's
(B) Strings of a's, whose length is a prime number
(C) Set of all palindromes made up of a's and b's
(D) Strings of a's whose length is a perfect square
(a) (A) and (B) only
(b) (A), (B) and (C) only
(c) (B), (C) and (D) only
(d) (B) and (D) only

20. Consider the languages $L_1 = \phi$ and $L_2 = \{1\}$. Which one of the following represents $L_1^* \cup L_2^* L_1^*$?

(a) $\{\in\}$ (b) $\{\in, 1\}$ (c) ϕ (d) 1^*

21. Given the following statements :
(A) A class of languages that is closed under union and complementation has to be closed under intersection.
(B) A class of languages that is closed under union and intersection has to be closed under complementation.
Which of the following option is correct ?
(a) Both (A) and (B) are false
(b) Both (A) and (B) are true
(c) (A) is true, (B) is false
(d) (A) is false, (B) is true

22. Let G = (V, T, S, P) be a context-free grammar such that every one of its productions is of the form $A \to v$, with $|v| = K > 1$. The derivation tree for any $W \in L(G)$ has a height h such that

(a) $\log_K |W| \le h \le \log_K \left(\frac{|W| - 1}{K - 1} \right)$
(b) $\log_K |W| \le h \le \log_K (K|W|)$
(c) $\log_K |W| \le h \le K \log_K |W|$
(d) $\log_K |W| \le h \le \left(\frac{|W| - 1}{K - 1} \right)$

23. Given the following two languages :

$L_1 = \{a^n b^n \mid n \ge 0,\ n \ne 100\}$

$L_2 = \{w \in \{a, b, c\}^* \mid n_a(w) = n_b(w) = n_c(w)\}$

Which of the following option is correct ?

(a) Both L_1 and L_2 are not context free language

(b) Both L_1 and L_2 are context free language

(c) L_1 is context free language, L_2 is not context free language

(d) L_1 is not context free language, L_2 is context free language

24. A recursive function h, is defined as follows :

$h(m) = k$, if $m = 0$

$= 1$, if $m = 1$

$= 2h(m-1) + 4h(m-2)$, if $m \geq 2$

If the value of $h(4)$ is 88, then the value of k is :

(a) 0 (b) 1 (c) 2 (d) –1

25. Suppose there are n stations in a slotted LAN. Each station attempts to transmit with a probability P in each time slot. The probability that only one station transmits in a given slot is _____.

(a) $nP(1-P)^{n-1}$ (b) nP (c) $P(1-P)^{n-1}$ (d) $n^P(1-P)^{n-1}$

26. Station A uses 32 byte packets to transmit messages to station B using sliding window protocol. The round trip delay between A and B is 40 milliseconds and the bottleneck bandwidth on the path between A and B is 64 kbps. The optimal window size of A is _____.

(a) 20 (b) 10 (c) 30 (d) 40

27. Let $G(x)$ be generator polynomial used for CRC checking. The condition that should be satisfied by $G(x)$ to correct odd numbered error bits, will be :

(a) $(1+x)$ is factor of $G(x)$ (b) $(1-x)$ is factor of $G(x)$

(c) $(1-x^2)$ is factor of $G(x)$ (d) x is factor of $G(x)$

28. In a packet switching network, if the message size is 48 bytes and each packet contains a header of 3 bytes. If 24 packets are required to transmit the message, the packet size is _____.

(a) 2 bytes (b) 1 byte (c) 4 bytes (d) 5 bytes

29. In RSA public key cryptosystem suppose $n = p * q$ where p and q are primes. (e, n) and (d, n) are public and private keys respectively. Let M be an integer such that $o < M < N$ and $\phi(n) = (p-1)(q-1)$. Which of the following equations represent RSA public key cryptosystem ?

I. $C \equiv M^e \pmod n$

$M \equiv (C)^d \pmod n$

II. $ed \equiv 1 \pmod n$

III. $ed \equiv 1 \pmod{\phi(n)}$

IV. $C \equiv M^e \pmod{\phi(n)}$

$M \equiv C^d \pmod{\phi(n)}$

Codes:

(a) I and II (b) I and III (c) II and III (d) I and IV

30. A node X on a 10 Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2 Mbps. Token bucket is initially filled with 16 megabits. The maximum duration taken by X to transmit at full rate of 10 Mbps is _____ secs.

(a) 1 (b) 2 (c) 3 (d) 4

31. The assymptotic upper bound solution of the recurrence relation given by

$T(n) = 2T\left(\frac{n}{2}\right) + \frac{n}{\lg n}$ is :

(a) $O(n^2)$ (b) $O(n \lg n)$ (c) $O(n \lg \lg n)$ (d) $O(\lg \lg n)$

32. Any decision tree that sorts n elements has height _____.

(a) $\Omega(\lg n)$ (b) $\Omega(n)$ (c) $\Omega(n \lg n)$ (d) $\Omega\left(n^2\right)$

33. Red-black trees are one of many search tree schemes that are "balanced" in order to guarantee that basic dynamic-set operations take _____ time in the worst case.

(a) O(1) (b) $O(\lg n)$ (c) O(n) (d) $O(n \lg n)$

34. The minimum number of scalar multiplication required, for parenthesization of a matrix-chain product whose sequence of dimensions for four matrices is <5, 10, 3, 12, 5> is

(a) 630 (b) 580 (c) 480 (d) 405

35. Dijkstra's algorithm is based on

(a) Divide and conquer paradigm (b) Dynamic programming
(c) Greedy Approach (d) Backtracking paradigm

36. Match the following with respect to algorithm paradigms :

List - I	List - II
A. Merge sort	i. Dynamic programming
B. Huffman coding	ii. Greedy approach
C. Optimal polygon triangulation	iii. Divide and conquer
D. Subset sum problem	iv. Back tracking

Codes :

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

37. Abstraction and encapsulation are fundamental principles that underlie the object oriented approach to software developement. What can you say about the following two statements ?

I. Abstraction allows us to focus on what something does without considering the complexities of how it works.
II. Encapsulation allows us to consider complex ideas while ignoring irrelevant detail that would confuse us.

(a) Neither I not II is correct. (b) Both I and II are correct.
(c) Only II is correct. (d) Only I is correct.

38. Given the array of integers 'array' shown below :

13	7	27	2	18	33	9	11	22	8

What is the output of the following JAVA statements ?

```
int [ ] p = new int [10];
int [ ] q = new int [10];
for (int k = 0; k < 10; k ++)
        p[k] = array [k];
q = p;
p[4] = 20;
System.out.println(array [4] + ":" + q[4]);
```

(a) 20 : 20 (b) 18 : 18 (c) 18 : 20 (d) 20 : 18

39. Consider the following JAVA program :

```
public class First {
    public static int CBSE (in x) {
            if (x < 100) x = CBSE (x + 10);
```

```
            return (x – 1);
        }
    public static void main (String[] args){
            System.out.print(First.CBSE(60));
    }
}
```

What does this program print ?
(a) 59 (b) 95 (c) 69 (d) 99

40. Which of the following statement(s) with regard to an abstract class in JAVA is/are TRUE ?
I. an abstract class is one that is not used to create objects.
II. An abstract class is designed only to act as a base class to be inherited by other classes.
(a) Only I (b) Only II (c) Neither I nor II (d) Both I and II

41. Which of the following HTML code will affect the vertical alignment of the table content ?
(a) <td style = “vertical-align : middle”> Text Here </td>
(b) <td valign = “centre”> Text Here </td>
(c) <td style = “text-align : center”> Text Here </td>
(d) <td align = “middle”> Text Here </td>

42. What can you say about the following statements ?
I. XML tags are case-insensitive.
II. In JavaScript, identifier names are case-sensitive.
III. Cascading Style Sheets (CSS) cannot be used with XML.
IV. All well-formed XML documents must contain a document type definition.
(a) only I and II are false. (b) only III and IV are false.
(c) only I and III are false. (d) only II and IV are false.

43. Which of the following statement(s) is/are TRUE with regard to software testing ?
I. Regression testing technique ensures that the software product runs correctly after the changes during maintenance.
II. Equivalence partitioning is a white-box testing technique that divides the input domain of a program into classes of data from which test cases can be derived.
(a) only I (b) only II (c) both I and II (d) neither I nor II

44. Which of the following are facts about a top-down software testing approach ?
I. Top-down testing typically requires the tester to build method stubs.
II. Top-down testing typically requires the tester to build test drivers.
(a) Only I (b) Only II (c) Both I and II (d) Neither I nor II

45. Match the terms related to Software Configuration management (SCM) in **List - I** with the descriptions in **List - II.**

List - I	**List - II**
I. Version	A. An instance of a system that is distributed to customers.
II. Release	B. An instance of a system which is functionally identical to other instances, but designed for different hardware/software configurations.
III. Variant	C. An instance of a system that differs, in some way, from other instances.

Codes :
(a) I-B, II-C, III-A (b) I-C, II-A, III-B (c) I-C, II-B, III-A (d) I-B, II-A, III-C

46. A software project was estimated at 352 Function Points (FP). A four person team will be assigned to this project consisting of an architect, two programmers, and a tester. The salary of the architect is ` 80,000 per month, the programmer ` 60,000 per month and the tester ` 50,000 per month. The average productivity for the team is 8 FP per person month. Which of the following represents the projected cost of the project ?
(a) ` 28,16,000 (b) ` 20,90,000 (c) ` 26,95,000 (d) ` 27,50,000

47. Complete each of the following sentences in **List - I** on the left hand side by filling in the word or phrase from the **List - II** on the right hand side that best completes the sentence :

List - I	**List - II**
I. Determining whether you have built the right system is called _____	A. Software testing
II. Determining whether you have built the system right is called _____	B. Software verification
III. _____ is the process of demonstrating the existence of defects or providing confidence that they do not appear to be present.	C. Software debugging
IV. _____ is the process of discovering the cause of a defect and fixing it.	D. Software validation

Codes :
(a) I-B, II-D, III-A, IV-C (b) I-B, II-D, III-C, IV-A
(c) I-D, II-B, III-C, IV-A (d) I-D, II-B, III-A, IV-C

48. A software company needs to develop a project that is estimated as 1000 function points and is planning to use JAVA as the programming language whose approximate lines of code per function point is accepted as 50. considering a = 1.4 as multiplicative factor, b = 1.0 as exponention factor for the basic COCOMO effort equation and c = 3.0 as multiplicative factor, d = 0.33 as exponention factor for the basic COCOMO duration equation, aspproximately how long does the project take to complete ?
(a) 11.2 months (b) 12.2 months (c) 13.2 months (d) 10.2 months

49. A memory management system has 64 pages with 512 bytes page size. Physical memory consists of 32 page frames. Number of bits required in logical and physical address are respectively :
(a) 14 and 15 (b) 14 and 29 (c) 15 and 14 (d) 16 and 32

50. Consider a disk queue with I/O requests on the following cylinders in their arriving order :
6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45
The disk head is assumed to be at cylinder 23 and moving in the direction of decreasing number of cylinders. Total number of cylinders in the disk is 150. The disk head movement using SCAN-scheduling algorithm is :
(a) 172 (b) 173 (c) 227 (d) 228

51. Match the following for Unix file system :

List - I	List - II
A. boot block	i. Information about file system, free block list, free inode list etc.
B. Super block	ii. Contains operating system files as well as program and data files created by users.
C. Inode block	iii. Contains boot program and partition table.
D. Data block	iv. Contains a table for every file in the file system. Attributes of files are stored here.

Codes :

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

52. Some of the criteria for calculation of priority of a process are :
(A) Processor utilization by an individual process.
(B) Weight assigned to a user or group of users.
(C) Processor utilization by a user or group of processes
In fair share scheduler, priority is calculated based on :
(a) only (A) and (B) (b) only (A) and (C) (c) (A), (B) and (C) (d) only (B) and (C)

53. One of the disadvantages of user level threads compared to Kernel level threads is
(a) If a user level thread of a process executes a system call, all threads in that process are blocked.
(b) Scheduling is application dependent.
(c) Thread switching doesn't require kernel mode privileges.
(d) The library procedures invoked for thread management in user level threads are local procedures.

54. Which statement is not correct about "init" process in Unix ?
(a) It is generally the parent of the login shell.
(b) It has PID 1.
(c) It is the first process in the system.
(d) Init forks and execs a 'getty' process at every port connected to a terminal.

55. Consider following two rules R1 and R2 in logical reasoning in Artificial Intelligence (AI):

R1 : From $\alpha \supset \beta$

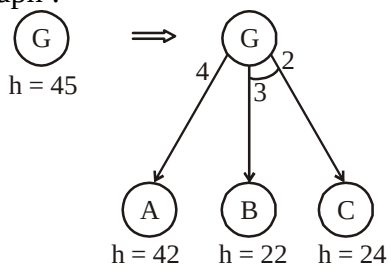
$$\frac{\text{and } \alpha}{\text{Inter } \beta}$$ is known as Modus Tollens (MT)

R2 : From $\alpha \supset \beta$

$$\frac{\text{and } \neg \beta}{\text{Inter } \neg \alpha}$$ is known as Modus Ponens (MP)

(a) Only R1 is correct. (b) Only R2 is correct.
(c) Both R1 and R2 are correct. (d) Neither R1 nor R2 is correct.

56. Consider the following AO graph :



Which is the best node to expand next by AO* algorithm ?
(a) A (b) B (c) C (d) B and C

57. In Artificial Intelligence (AI), what is present in the planning graph ?
(a) Sequence of levels (b) Literals (c) Variables (d) Heuristic estimates

58. What is the best method to go for the game playing problem ?
(a) Optimal Search (b) Random Search (c) Heuristic Search (d) Stratified Search

59. Which of the following statements is true ?
(a) The sentence S is a logical consequence of S_1, ..., S_n if and only if $S_1 \wedge S_2 \wedge ..... \wedge S_n \rightarrow S$ is satisfiable.
(b) The sentence S is a logical consequence of $S_1, ..., S_n$ if and only if $S_1 \wedge S_2 \wedge ..... \wedge S_n \rightarrow S$ is valid.
(c) The sentence S is a logical consequence of $S_1, ..., S_n$ if and only if $S_1 \wedge S_2 \wedge ..... \wedge S_n \wedge \neg S$ is consistent.
(d) The sentence S is a logical consequence of $S_1, ..., S_n$ if and only if $S_1 \wedge S_2 \wedge ..... \wedge S_n \wedge S$ is inconsistent.

60. The first order logic (FOL) statement $((R \vee Q) \wedge (P \vee \neg Q))$ is equivalent to which of the following ?
(a) $((R \vee \neg Q) \wedge (P \vee \neg Q) \wedge (R \vee P))$ (b) $((R \vee Q) \wedge (P \vee \neg Q) \wedge (R \vee P))$
(c) $((R \vee Q) \wedge (P \vee \neg Q) \wedge (R \vee \neg P))$ (d) $((R \vee Q) \wedge (P \vee \neg Q) \wedge (\neg R \vee P))$

61. Given the following two statements :
A. $L = \{w \mid n_a(w) = n_b(w)\}$ is deterministic context free language, but not linear.
B. $L = \{a^n b^n\} \cup \{a^n b^{2n}\}$ is linear, but not deterministic context free language.
Which of the following options is correct ?
(a) Both (A) and (B) are false. (b) Both (A) and (B) are true.
(c) (A) is true, (B) is false. (d) (A) is false, (B) is true.

62. Which of the following pairs have different expressive power ?
(a) Single-tape-turning machine and multi-dimensional turing machine.
(b) Multi-tape turing machine and multi-dimensional turing machine.
(c) Deterministic push down automata and non-deterministic pushdown automata.
(d) Deterministic finite automata and Non-deterministic finite automata

63. Which of the following statements is false ?
(a) Every context-sensitive language is recursive.
(b) The set of all languages that are not recursively enumerable is countable.
(c) The family of recursively enumerable languages is closed under union.
(d) The families of recursively enumerable and recursive languages are closed under reversal.

64. Let C be a binary linear code with minimum distance 2t + 1 then it can correct upto _____ bits of error.
(a) t + 1 (b) t (c) t – 2 (d) $\frac{t}{2}$

65. A t-error correcting q-nary linear code must satisfy :

$M\sum_{i=0}^{t}\binom{n}{i}(q-1)^{i} \le X$ Where, M is the number of code words and X is

(a) q^n (b) q^t (c) q^{-n} (d) q^{-t}

66. Names of some of the Operating Systems are given below :
(A) MS-DOS (B) XENIX (C) OS/2
In the above list, following operating systems didn't provide multiuser facility.
(a) (A) only (b) (A) and (B) only (c) (B) and (C) only (d) (A), (B) and (C)

67. From the given data below :
a b b a a b b a a b
which one of the following is not word in the dictionary created by LZ-coding (the initial words are a, b) ?
(a) a b (b) b b (c) b a (d) b a a b

68. With respect to a loop in the transportation table, which one of the following is not correct ?
(a) Every loop has an odd no. of cells and atleast 5.
(b) Closed loops may or may not be square in shape.
(c) All the cells in the loop that have a plus or minus sign, except the starting cell, must be occupied cells.
(d) Every loop has an even no. of cells and atleast four.

69. At which of the following stage(s), the degeneracy do not occur in transportation problem ?
(m, n represents number of sources and destinations respectively)
(A) While the values of dual variables u_i and v_j cannot be computed.
(B) While obtaining an initial solution, we may have less than $m+n-1$ allocations.
(C) At any stage while moving towards optimal solution, when two or more occupied cells with the same minimum allocation become unoccupied simultaneously.
(D) At a stage when the no. of +ve allocation is exactly $m+n-1$.
(a) (A), (B) and (C) (b) (A), (C) and (D) (c) (A) and (D) (d) (A), (B), (C) and (D)

70. Consider the following LPP :

Min. Z = $x_1 + x_2 + x_3$

Subject to $3x_1 + 4x_3 \le 5$

$5x_1 + x_2 + 6x_3 = 7$

$8x_1 + 9x_3 \ge 2,$

$x_1, x_2, x_3 \ge 0$

The standard form of this LPP shall be :

(a) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 = 7;$

$8x_1 + 9x_3 - x_5 = 2;$

$x_1, x_2, x_3, x_4, x_5 \ge 0$

(b) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5 - 1(x_6) - 1(x_7)$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 + x_6 = 7;$

$8x_1 + 9x_3 - x_5 + x_7 = 2;$

x_1 to $x_7 \geq 0$

(c) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5 + 0x_6$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 = 7;$

$8x_1 + 9x_3 - x_5 + x_6 = 2;$

x_1 to $x_6 \geq 0$

(d) Min. Z = $x_1 + x_2 + x_3 + 0x_4 + 0x_5 + 0x_6 + 0x_7$

Subject to $3x_1 + 4x_3 + x_4 = 5;$

$5x_1 + x_2 + 6x_3 + x_6 = 7;$

$8x_1 + 9x_3 - x_5 + x_7 = 2;$

x_1 to $x_7 \geq 0$

71. Let R and S be two fuzzy relations defined as :

$$R = \begin{array}{c} \\ x_1 \\ x_2 \end{array}\begin{array}{c} \begin{matrix} y_1 & y_2 \end{matrix} \\ \begin{bmatrix} 0.6 & 0.4 \\ 0.7 & 0.3 \end{bmatrix} \end{array} \text{ and } S = \begin{array}{c} \\ y_1 \\ y_2 \end{array}\begin{array}{c} \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{bmatrix} 0.8 & 0.5 & 0.1 \\ 0.0 & 0.6 & 0.4 \end{bmatrix} \end{array}$$

Then, the resulting relation, T, which relates elements of universe x to the elements of universe z using max-min composition is given by :

(a) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array}\begin{array}{c} \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{bmatrix} 0.4 & 0.6 & 0.4 \\ 0.7 & 0.7 & 0.7 \end{bmatrix} \end{array}$

(b) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array}\begin{array}{c} \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{bmatrix} 0.4 & 0.6 & 0.4 \\ 0.8 & 0.5 & 0.4 \end{bmatrix} \end{array}$

(c) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array}\begin{array}{c} \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{bmatrix} 0.6 & 0.5 & 0.4 \\ 0.7 & 0.5 & 0.3 \end{bmatrix} \end{array}$

(d) $T = \begin{array}{c} \\ x_1 \\ x_2 \end{array}\begin{array}{c} \begin{matrix} z_1 & z_2 & z_3 \end{matrix} \\ \begin{bmatrix} 0.6 & 0.5 & 0.5 \\ 0.7 & 0.7 & 0.7 \end{bmatrix} \end{array}$

72. A neuron with 3 inputs has the weight vector $[0.2 \; -0.1 \; 0.1]^T$ and a bias $\theta = 0$. If the input vector is $X = [0.2 \; 0.4 \; 0.2]^T$ then the total input to the neuron is :

(a) 0.20 (b) 1.0 (c) 0.02 (d) –1.0

73. Which of the following neural networks uses supervised learning ?

(A) Multilayer perceptron

(B) Self organizing feature map

(C) Hopfield network

(a) (A) only (b) (B) only (c) (A) and (B) only (d) (A) and (C) only

74. Unix command to change the case of first three lines of file "shortlist" from lower to upper
(a) $ tr '[a – z]' '[A – Z]' shortlist ¦ head-3 (b) $ head-3 shortlist ¦ tr '[a – z]' '[A – Z]'
(c) $ tr head-3 shortlist '[A – Z]' '[a – z]' (d) $ tr shortlist head-3 '[a – z]' '[A – Z]'

75. Match the following vi commands in Unix :

List - I	**List - II**
A. : w	i. saves the file and quits editing mode
B. : x	ii. excapes unix shell
C. : q	iii. saves file and remains in editing mode
D. : sh	iv. quits editing mode and no changes are saved to the file

Codes :

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