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Preface

It is commonly said "Teaching is the profession which creates all other professions" and "Research is the new knowledge"; so aren't these professions an instruments to serve the nation?

Of course yes, from Dr.S.Radhakrishnan to Dr. APJ Abdul Kalam, they will be remembered for their marvellous works, apart from technical jobs in engineering services or PSUs, this is equally a good choice to contribute in the saga of India's development. UGC-NET provides opportunity for budding engineers to become future renowned scholars of this country and entire world.

This is one such exam which opens a direct gateway to lectureship in colleges, universities as an Assistant Professor and also to make remarkable progress in the field of research by awarding JRF.

Preparation of any exam is complete only when set of variety of questions is practised. To help all the students in their preparation MADE EASY team made efforts and came up with compilation of all previous years' questions of UGC-NET exam with accurate and detailed solutions. This book is not only helpful for UGC-NET but also for GATE, HAL, BARC, CIL, BHEL, DRDO, UPPCL, SAIL, GAIL, DMRC, CRIS, ISRO and other competitive exams for engineering graduates.

I would like to give credit to MADE EASY team for solving previous years' questions with correctness and making it a medium to serve students. Providing good study material and quality guidance are two ways to help each and every student and this book fulfils my aim to contribute in success of every aspirant.



B. Singh (Ex. IES)

With Best Wishes

B. Singh

CMD, MADE EASY Group

UGC-NET

Previous Year Solved Papers

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Chapter

1

UGC NET : 2004 (D2)

Note: This paper contains fifty (50) multiple-choice questions, each question carrying two (2) marks.
Attempt all of them.

1. $A \vee A = A$ is called :
(a) Identity law (b) De Morgan's law
(c) Idempotent law (d) Complement law
2. If $f(x) = x+1$ and $g(x) = x+3$ then $f \circ f \circ f \circ f$ is
(a) g (b) $g + 1$
(c) g^4 (d) None of these
3. The context-free languages are closed for:
(i) Intersection
(ii) Union
(iii) Complementation
(iv) Kleene Star
then
(a) (i) and (iv) (b) (i) and (iii)
(c) (ii) and (iv) (d) (ii) and (iii)
4. The following lists are the degrees of all the vertices of a graph
(i) 1, 2, 3, 4, 5 (ii) 3, 4, 5, 6, 7
(iii) 1, 4, 5, 8, 6 (iv) 3, 4, 5, 6
then
(a) (i) and (ii) (b) (iii) and (iv)
(c) (iii) and (ii) (d) (ii) and (iv)
5. If I_m denotes the set of integers modulo m , then the following are fields with respect to the operations of addition modulo m and multiplication modulo m :
(i) \mathbb{Z}_{23} (ii) \mathbb{Z}_{29}
(iii) \mathbb{Z}_{31} (iv) \mathbb{Z}_{33}
Then
(a) (i) only
(b) (i) and (ii) only
(c) (i), (ii) and (iii) only
(d) (i), (ii), (iii) and (iv)
6. An example of a binary number which is equal to its 2's complement is :
(a) 1100 (b) 1001
(c) 1000 (d) 1111

7. When a tri-state logic device is in the third state, then :
(a) it draws low current
(b) it does not draw any current
(c) it draws very high current
(d) it presents a low impedance
8. An example of a connective which is not associative is :
(a) AND (b) OR
(c) EX-OR (d) NAND
9. Essential hazards may occur in :
(a) Combinational logic circuits
(b) Synchronous sequential logic circuits
(c) Asynchronous sequential logic circuits working in the fundamental mode
(d) Asynchronous sequential logic circuits working in the pulse mode
10. The characteristic equation of a T flip-flop is
(a) $Q_{n+1} = T\bar{Q}_n + \bar{T}Q_n$
(b) $Q_{n+1} = T + Q_n$
(c) $Q_{n+1} = TQ_n$
(d) $Q_{n+1} = \bar{T}\bar{Q}_n$
The symbols used have the usual meaning.
11. Suppose x and y are two Integer Variables having values Ox 5AB6 and Ox 61CD respectively. The result (in hex) of applying bitwise operator AND to x and y will be :
(a) Ox 5089 (b) Ox 4084
(c) Ox 78A4 (d) Ox 3AD1
12. Consider the following statements,

```
Int i = 4, j = 3, k = 0;  
k = ++i - --j + i++ - --j + j ++;
```

What will be the values of i , j and k after the statement.
(a) 7, 2, 8 (b) 5, 2, 10
(c) 6, 2, 8 (d) 4, 2, 8

13. What is the value of the arithmetic expression (Written in C)

$$2 * 3 / 4 - 3 / 4 * 2$$
- (a) 0 (b) 1
 (c) 1.5 (d) None of these
14. A function object :
 (a) is an instance of a class for which operator `()` is a member function.
 (b) is an instance of a class for which operator `→` is a member function.
 (c) is a pointer to any function
 (d) is a member function of a class
15. Polymorphism means :
 (a) A template function
 (b) Runtime type identification within a class hierarchy
 (c) Another name for operator overloading
 (d) Virtual inheritance
16. The E-R model is expressed in terms of :
 (i) Entities
 (ii) The relationship among entities
 (iii) The attributes of the entities
 Then
 (a) (i) and (iii) (b) (i), (ii) and (iii)
 (c) (ii) and (iii) (d) None of these
17. Specialization is a _____ process.
 (a) Top-down (b) Bottom-up
 (c) Both (a) and (b) (d) None of these
18. The completeness constraint has rules:
 (a) Supertype, Subtype
 (b) Total specialization, partial specialization
 (c) Specialization, Generalization
 (d) All of the above
19. The entity type on which the _____ type depends is called the identifying owner.
 (a) Strong entity (b) Relationship
 (c) Weak entity (d) E-R
20. Match the following :

List-I

- A. 2 NF
- B. 3 NF
- C. 4 NF
- D. 5 NF

List-II

- 1. Transitive dependencies eliminated
- 2. Multivalued attribute removed
- 3. Contains no partial functional dependencies
- 4. Contains no join dependency

Codes:

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

21. What item is at the root after the following sequence of insertions into an empty splay tree:
 1, 11, 3, 10, 8, 4, 6, 5, 7, 9, 2, ?
- (a) 1 (b) 2
 (c) 4 (d) 8
22. Suppose we are implementing quadratic probing with a Hash function, $\text{Hash}(y) = X \bmod 100$. If an element with key 4594 is inserted and the first three locations attempted are already occupied, then the next cell that will be tried is :
 (a) 2 (b) 3
 (c) 9 (d) 97
23. Weighted graph :
 (a) Is a bi-directional graph
 (b) Is directed graph
 (c) Is graph in which number associated with arc
 (d) Eliminates table method
24. What operation is supported in constant time by the doubly linked list, but not by the singly linked list?
 (a) Advance (b) Backup
 (c) First (d) Retrieve
25. How much extra space is used by heapsort?
 (a) $O(1)$ (b) $O(\log n)$
 (c) $O(n)$ (d) $O(n^P)$
26. Error control is needed at the transport layer because of potential error occurring _____.
 (a) from transmission line noise
 (b) in router
 (c) from out of sequence delivery
 (d) from packet losses
27. Making sure that all the data packets of a message are delivered to the destination is _____ control.
 (a) Error (b) Loss
 (c) Sequence (d) Duplication
28. Which transport class should be used with a perfect network layer?
 (a) TP0 and TP2
 (b) TP1 and TP3

- (c) TP0, TP1, TP3
 (d) TP0, TP1, TP2, TP3, TP4
- 29.** Which transport class should be used with residual-error network layer?
 (a) TP0, TP2
 (b) TP1, TP3
 (c) TP1, TP3, TP4
 (d) TP0, TP1, TP2, TP3, TP4
- 30.** Virtual circuit is associated with a _____ service.
 (a) Connectionless
 (b) Error-free
 (c) Segmentation
 (d) Connection-oriented
- 31.** Which activity is not included in the first pass of two pass assemblers?
 (a) Build the symbol table
 (b) Construct the intermediate code
 (c) Separate mnemonic opcode and operand fields
 (d) None of the above
- 32.** Which of the following is not collision resolution technique?
 (a) Hash addressing (b) Chaining
 (c) Both (a) and (b) (d) Indexing
- 33.** Code optimization is responsibility of :
 (a) Application programmer
 (b) System programmer
 (c) Operating system
 (d) All of the above
- 34.** Which activity is included in the first pass of two pass assemblers?
 (a) Build the symbol table
 (b) Construct the intermediate code
 (c) Separate mnemonic opcode and operand fields
 (d) None of these
- 35.** In two pass assembler the symbol table is used to store:
 (a) Label and value (b) Only value
 (c) Mnemonic (d) Memory Location
- 36.** Semaphores are used to :
 (a) Synchronise critical resources to prevent deadlock
 (b) Synchronise critical resources to prevent contention
- (c) Do I/O
 (d) Facilitate memory management
- 37.** In which of the following storage replacement strategies, is a program placed in the largest available hole in the memory?
 (a) Best fit (b) First fit
 (c) Worst fit (d) Buddy
- 38.** Remote computing system involves the use of time sharing systems and :
 (a) Real time processing
 (b) Batch processing
 (c) Multiprocessing
 (d) All of the above
- 39.** Non modifiable procedures are called
 (a) Serially usable procedures
 (b) Concurrent procedures
 (c) Reentrant procedures
 (d) Topdown procedures
- 40.** Match the following
- | List-I | List-II |
|-------------------------|----------------|
| A. Disk scheduling | 1. Round robin |
| B. Batch processing | 2. Scan |
| C. Time sharing | 3. LIFO |
| D. Interrupt processing | 4. FIFO |
- Codes:**
- | A | B | C | D |
|-------|---|---|---|
| (a) 3 | 4 | 2 | 1 |
| (b) 4 | 3 | 2 | 1 |
| (c) 2 | 4 | 1 | 3 |
| (d) 3 | 4 | 1 | 2 |
- 41.** The main objective of designing various modules of a software system is :
 (a) To decrease the cohesion and to increase the coupling
 (b) To increase the cohesion and to decrease the coupling
 (c) To increase the coupling only
 (d) To increase the cohesion only
- 42.** Three essential components of a software project plan are :
 (a) Team structure, Quality assurance plans, Cost estimation
 (b) Cost estimation, Time estimation, Quality assurance plan
 (c) Cost estimation, Time estimation, Personnel estimation
 (d) Cost estimation, Personnel estimation, Team structure

43. Reliability of software is dependent on :
 (a) Number of errors present in software
 (b) Documentation
 (c) Testing suites
 (d) Development Processes
44. In transform analysis, input portion is called:
 (a) Afferent branch
 (b) Efferent branch
 (c) Central Transform
 (d) None of the above
45. The Function Point (FP) metric is :
 (a) Calculated from user requirements
 (b) Calculated from lines of code
 (c) Calculated from software's complexity assessment
 (d) None of the above
46. Data Mining can be used as _____ tool.
 (a) Software (b) Hardware
 (c) Research (d) Process
47. The processing speeds of pipeline segments are usually :
 (a) Equal (b) Unequal
 (c) Greater (d) None of these
48. The cost of a parallel processing is primarily determined by :
 (a) Time complexity
 (b) Switching complexity
 (c) Circuit complexity
 (d) None of the above
49. A data warehouse is always _____.
 (a) Subject oriented
 (b) Object oriented
 (c) Program oriented
 (d) Compiler oriented
50. The term 'hacker' was originally associated with:
 (a) A computer program
 (b) Virus
 (c) Computer professionals who solved complex computer problems.
 (d) All of the above



ANSWERS

- | | | | | | | |
|--------|---------|---------|---------|-------------|---------|---------|
| 1. (c) | 8. (d) | 15. (b) | 22. (d) | 29. (b) | 36. (a) | 43. (a) |
| 2. (b) | 9. (c) | 16. (b) | 23. (c) | 30. (d) | 37. (c) | 44. (a) |
| 3. (c) | 10. (a) | 17. (a) | 24. (b) | 31. (d) | 38. (b) | 45. (c) |
| 4. (b) | 11. (b) | 18. (b) | 25. (a) | 32. (d) | 39. (c) | 46. (c) |
| 5. (c) | 12. (*) | 19. (c) | 26. (b) | 33. (b) | 40. (c) | 47. (b) |
| 6. (c) | 13. (b) | 20. (b) | 27. (a) | 34. (a,b,c) | 41. (b) | 48. (b) |
| 7. (a) | 14. (a) | 21. (b) | 28. (a) | 35. (a) | 42. (b) | 49. (a) |
| | | | | | | 50. (c) |

EXPLANATIONS

1. (c)

In **boolean algebra**, idempotent law states that combining a quantity with itself either by logical addition or logical multiplication will result in a logical sum or product that is the equivalent of the quantity (**ex.** $A \vee A = A$; $A \wedge A = A$).

2. (b)

If $f(x) = x+1$ and $g(x) = x+3$
then composition

$$fog(x) = x + 4; gof(x) = x + 4$$

and, $f(x) = x+2$

$$fof(x) = x+3$$

$$fofof(x) = x+4 = (x+3)+1$$

$$fofofof(x) = g(x)+1$$

3. (c)

- The **context-free languages** are closed under union and Kleene star properties.
- The **context-free languages** are not closed under complement, intersection or difference properties.

4. (b)

The **handshaking lemma** is the statement that every finite undirected graph has an even number of vertices with odd degree.

- (i) Number of vertices with odd degree is 3 which is not possible.
- (ii) Number of vertices with odd degree is 3 which is not possible
- (iii) Number of vertices with odd degree is 2.
- (iv) Number of vertices with odd degree is 2.

5. (c)

Basically, a **field** is a thing where you can add, subtract, multiply and divide. It is bit tricky to see that the first three (Z_{23}, Z_{29}, Z_{31}) are indeed fields. In fact, Z_p happens to be a field always when P is prime, and this result follows from Fermat's little theorem.

6. (c)

- (a) $1100 \rightarrow$ 2's complement $\rightarrow 0011 + 1 = 0100$
- (b) $1001 \rightarrow$ 2's complement $\rightarrow 0110 + 1 = 0111$
- (c) $1000 \rightarrow$ 2's complement $\rightarrow 0111 + 1 = 1000$
- (d) $1111 \rightarrow$ 2's complement $\rightarrow 0000 + 1 = 0001$

7. (a)

The third state of tri-state logic has high impedance hence resulting to a low current.

8. (d)

Associativity: Within an expression containing two or more of the same associative connective in a row, the order of the operations does not matter as long as the sequence of the operands is not changed.

Formally, a binary operation $*$ on a set S is called associative if it satisfies the associative law.

$$(x * y) * z = x * (y * z) \text{ for all } x, y, z \text{ in } S.$$

AND, OR and EX-OR associative operators, but NAND is not, since,

$$(x \uparrow y) \uparrow z \neq x \uparrow (y \uparrow z)$$

$$\Rightarrow \overline{(x \wedge y) \wedge z} \neq \overline{x \wedge (y \wedge z)}$$

$$\Rightarrow (x \wedge y) \vee \bar{z} \neq \bar{x} \vee (y \wedge z)$$

9. (c)

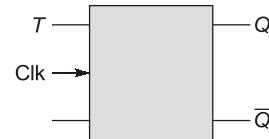
Essential hazard due to delay in different latches of different flip-flop. This results in the logic not

performing its function property. The three different most common kinds of hazards are usually referred to as static, dynamic and functions hazards.

These hazards may occur in **asynchronous sequential logic** circuits working in the fundamental mode.

10. (a)

T-flip-flop:



Characteristic equation:

T	$Q_{(n+1)}$
0	Q_n
1	\bar{Q}_n

Excitation table:

Q_n	$Q_{(n+1)}$	T
0	0	0
0	1	1
1	0	1
1	1	0

The characteristic equation of a T-flip-flop is

$$Q_{n+1} = T\bar{Q}_n + \bar{T}Q_n = T \oplus Q$$

Option (a) is true.

11. (b)

$$Ox 5AB6 = 0101 1010 1011 0110$$

$$Ox 61CD = 0110 0001 1100 1101$$

$$\text{AND} = 0100 0000 1000 0100$$

$$= Ox 4084$$

12. (*)

The code is undefined behaviour under the C standard, so its entirely upto what your specific compiler does, and there is absolutely no guaranteed it will do any thing the way any other compiler will.

13. (b)

$$2 \times 3/4 - 3/4 \times 2 = 6/4 - 3/8 = 1 - 0 = 1$$

C treat all expression values as integer.

14. (a)

A function object or functor (the two terms are synonymous) is simply any object that can be

called as if it is a function. An ordinary function is a function object and so is a function pointer; more generally, so is an object of a class that defines operator().

Functors (function objects or functional) are simply put object + ().

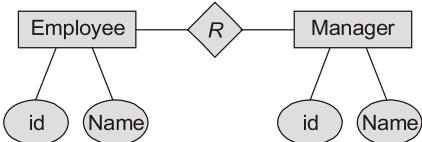
15. (b)

Polymorphism is an object-oriented programming concept that refers to the ability of a variable, function or object to take a multiple forms. Polymorphism is a runtime type identification within a class hierarchy. A language that features polymorphism allows developers to program in the general rather than program in the specific.

16. (b)

An **entity relationship model** (ER model) describes inter related things of interest in a specific domain of knowledge. An ER model is composed of entity types (which classify the things of interest) and specifies relationships that can exist between instances of those entity types.

Entity can have attributes e.g.,



17. (a)

- **Specialization** may be seen as the reverse process of generalization. Specialization is the abstracting process of introducing new characteristics to an existing class of objects to create one or more new classes of objects.
- In simple terms, a group of entities in specialization can be categorized into subgroups based on their characteristics. So, it is a top-down approach in which one higher level entity can be broken down into two lower level entity. It defines one or more prototypes of the super types and forming supertype / subtype relationships.

18. (b)

There are two rules of completeness constraint (i) Total specialization, and (ii) Partial specialization.

19. (c)

Weak entity is an entity that alone cannot uniquely identify its attributes therefore, it must use a foreign key in conjunction with its attributes to create a primary key. The foreign key is typically a primary key of an entity it is related to.

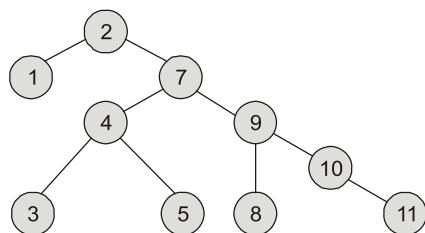
20. (b)

- **2NF** can not have partial functional dependencies.
- **3NF** can not have transitive dependencies.
- **4NF** deals with multivalued dependencies.
- **5NF** deals with join dependencies.

21. (b)

Splaying the tree for a certain element rearranges the tree so that the element is placed at the root of the tree.

Splay tree is :



The last element will be root node.

22. (d)

Since, hash(y) = 4594 Mod 100 = 94.

But first 3 location are already occupied which are attempted i.e., 94, 95, 96 so answer is 97.

23. (c)

A graph in which each edge carries a value is said to be a **weighted graph**.

24. (b)

Double-linked list are after easier to manipulate because they allow fast and easy sequential access to the list in both directions but single linked list can not access to back node or previous node.

25. (a)

Heap sort also computes with merge sort, which has the same time bounds. Merge sort requires $\Omega(n)$ auxiliary space, but heap sort requires only a constant amount. (i.e., $O(1)$).

26. (b)

Consider a scenario where there are two router in between source and destination. the packet flows

- from source to router R_1 correctly, hence the DLL will notify the delivery of the packet to DLL of source but then suddenly router R_2 gets down now, such kind of errors will be notified by transport layer.
27. (a) **Error control** (detection and correction) are technique that enable reliable delivery of digital data over unreliable communication channels.
28. (a) **TP0 and TP2** are perfect network layers, loss or data is zero.
OSI model defines five types of transport classes:
(i) **TP0** : Simple class
(ii) **TP1** : Basic error recovery class
(iii) **TP2** : Multiplexing class
(iv) **TP3** : Error recovery and multiplexing class
(v) **TP4** : Error detection and recovery class.
29. (b) **OSI model** defines five types of transport classes.
(i) **TP0** : Simple class
(ii) **TP1** : Basic error recovery class
(iii) **TP2** : Multiplexing class
(iv) **TP3** : Error recovery and multiplexing class
(v) **TP4** : Error detection and recovery class.
TP1 and TP3 are residual error network, some percentage of errors are never corrected.
30. (d)
 - A **Virtual Circuit** (VC) is a means of transporting data over a packet switching data over a packet switching computer network in such a way that it appears as though there is a dedicated physical layer link between the source and destination end systems of this data. The term virtual circuit is synonymous with virtual connection and virtual channel.
 - Virtual circuit** communication resembles circuit switching, since both are connection oriented, meaning that in both cases data is delivered in correct order and signalling overhead is required during a connection establishment phase.
31. (d) All are in given option (a), (b) and (c) is included in the first pass of two pass assembler.
32. (d) Both hash addressing and chaining are **collision resolution techniques**.
33. (b) **Code optimization** is any method of code optimization to improve code quality and efficiency. A program may be optimized so that it becomes a smaller size, consumes less memory, executes more rapidly or perform fewer input/output operations.
 - Application programmers** write programs to handle a specific job, such as a program to track inventory within an organization.
 - Systems programmers** writes program to maintain and control computer systems software, such as operating system and database management systems.
34. (a,b,c) All given option (a), (b) and (c) are included in the first pass of assembler.
35. (a) **A two-pass assembler** makes two passes over the input program. That is, it reads the program twice. On the first pass the symbol table is constructed. On the second pass, the complete symbol table is used to allow expressions to be evaluated without problems due to forward reference.
36. (a)
 - Semaphores can be used to solved synchronization problems, which arise through cooperation between processes basic use of semaphores, to critical sections of code.
 - Semaphores is variables whose values can be accessed and altered only by the wait(p) and signal(p) may process tries to access the same critical section.
37. (c)
 - First fit:** Choose the first hole we find that is large enough. This is fast, minimizing the search time.

- **Best fit:** Allocate the smallest available hole that is large enough to work. The search may be shortened by maintaining the list of holes ordered by size.
 - **Worst fit:** Allocate the largest hole. This is counter intuitive, but may be reasonable. It produces the largest left over holes. However, in practice, it performs worse.
38. (b) **Batch processing** is the execution of a series of programs on a computer without manual intervention (non-interactive).
39. (c)
- A **re-entrant procedure** is one in which a single copy of the program code can be shared by multiple users during the same period of time.
 - **Re-entrancy** is a useful, has 2 key aspects. The program code cannot modify itself and the local data for each user process must be stored separately.
40. (c)
- **SCAN** is a disk scheduling algorithm. Batch processing works in order first in first out.
 - **Round robin** is time sharing CPU scheduling algorithm.
 - **Interrupt** is processing in order last in first out.
41. (b)
- **Coupling** and **cohesion** are terms which occur together very frequently. Coupling refers to the interdependencies between modules, while cohesion describes how related are the functions within a single module. Low cohesion implies that a given module performs tasks which are not very related to each other and hence can create problems as the module becomes large.
 - All good software design will go for **high cohesion** and **low coupling**.
42. (b) The three essential components of a software project plan are **cost estimation**, **time estimation** and **quality assurance plan**.
43. (a) **Software reliability** is measured in terms of mean time between failures (MTBF). Reliability increases when errors or bugs from the program are removed.
44. (a) The input portion of the DFD includes processes that transform input data from physical (e.g., character from terminal) to logical forms (e.g., internal tables, lists etc). Each input portion is called an afferent branch.
45. (c) A **function point** is a ‘unit of measurement’ to express the amount of business functionality an information system (as a product) provides to a user. Function points are used to compute a functional size measurement of software. The cost (in dollars or hours) of a single unit is calculated from past projects.
46. (c) **Data mining** is a process used by companies to turn raw data into useful information. By using software to look for patterns in large batches of data, businesses can develop more effective marketing strategies as well as increase sales and decrease costs.
47. (b) The speed of the pipelining is determined by the speed of the stage, since, the processing speed of pipeline segments are unequal.
48. (b) The cost of a parallel processing is primarily determined by switching complexity.
49. (a) A **data warehouse** is a repository of historical data that are organized by subject to support decision makers in the organization.
50. (c) A **hacker** is any highly skilled computer expert.



Chapter 2

UGC NET : 2005 (D2)

Note: This paper contains fifty (50) objective-type questions, each question carrying two (2) marks. Attempt all of them.

1. T is a graph with n vertices. T is connected and has exactly $n - 1$ edges, then :
 - (a) T is a tree
 - (b) T contains no cycles
 - (c) Every pairs of vertices in T is connected by exactly one path
 - (d) All of these
2. If the proposition $\neg P \rightarrow Q$ is true, then the truth value of the proportion $\neg P \vee (P \rightarrow Q)$ is :
 - (a) True
 - (b) Multi-Valued
 - (c) False
 - (d) Cannot determined
3. Let A and B be two arbitrary events, then :
 - (a) $P(A \cap B) = P(A) P(B)$
 - (b) $P(P \cup B) = P(A) + P(B)$
 - (c) $P(A \cup B) \leq P(A) + P(B)$
 - (d) $P(A / B) = P(A \cap B) + P(B)$
4. Which sentence can be generated by

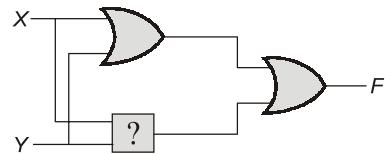
$$S \rightarrow d \mid bA, A \rightarrow d \mid ccA$$
 - (a) bccccd
 - (b) aabcccd
 - (c) ababcccd
 - (d) abbbcd
5. Regular expression $a + b$ denotes the set:
 - (a) $\{a\}$
 - (b) $\{\epsilon, a, b\}$
 - (c) $\{a, b\}$
 - (d) None of these
6. Which of the following is divisible by 4?
 - (a) 100101100
 - (b) 1110001110001
 - (c) 11110011
 - (d) 101010101010
7. A half-adder is also known as:
 - (a) AND Circuit
 - (b) NAND Circuit
 - (c) NOR Circuit
 - (d) EX-OR Circuit
8. Consider the following sequence of instructions :

$$a = a \oplus b, b = a \oplus b, a = b \oplus a$$

This Sequence

- (a) retains the value of the a and b
- (b) complements the value of a and b
- (c) swap a and b
- (d) negates values of a and b

9. Consider the following circuit :



to make it a Tautology the [?] should be :

- (a) NAND gate
- (b) AND gate
- (c) OR gate
- (d) EX-OR gate

10. When an inverter is placed between both inputs of an S-R flip-flop, the resulting flip flop is :
 - (a) JK flip-flop
 - (b) D-flip-flop
 - (c) T flip-flop
 - (d) None of these

11. What is the output of the following C program
- ```

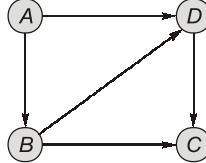
main() {
 printf("%d%d%d", sizeof(3.14f), sizeof(3.14),
 sizeof(3.141));
}

```
- (a) 4 4 4
  - (b) 4 8 10
  - (c) 8 4 8
  - (d) 8 8 8

12. The bitwise OR of 35 with 7 in C will be :
  - (a) 35
  - (b) 7
  - (c) 42
  - (d) 39

13. Data members and member function of a class by default is repectively :
  - (a) private and public
  - (b) public
  - (c) public and private
  - (d) private

14. Function over loading done at :
  - (a) Runtime
  - (b) Compile time

- (c) Linking time  
(d) Switching from function to function
- 15.** What will be the value of  $i$  for the following expression:  
 $\text{int } i = 11, i = 3 ;$   
 $i+ = (f > 3)? i \& 2 : 5 ;$
- (a) 2                   (b) 5  
(c) 13                  (d) 12
- 16.** A schema describes :  
(a) data elements  
(b) records and files  
(c) record relationship  
(d) all of the above
- 17.** One approach to standardizing storing of data :  
(a) MIS  
(b) CODASYL  
(c) Structured Programming  
(d) None of the above
- 18.** In a relational schema, each tuple is divided in fields called :  
(a) Relations           (b) Domains  
(c) Queries            (d) All of above
- 19.** An embedded printer provides :  
(a) Physical record key  
(b) An inserted Index  
(c) A secondary access path  
(d) All the above
- 20.** A locked file can be :  
(a) accessed by only one user  
(b) modified by users with the correct password  
(c) is used to hide sensitive information  
(d) both (b) and (c)
- 21.** In what tree, for every node the height of its left subtree and right subtree differ at least by one :  
(a) Binary search tree  
(b) AVL-tree  
(c) Threaded binary tree  
(d) Complete tree
- 22.** A hash function  $f$  defined as  $f(\text{key}) = \text{key mod } 7$ , 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 locations of 11 :  
(a) 3                   (b) 4  
(c) 5                   (d) 6
- 23.** Consider the graph, which of the following is a valid topological sorting?
- 
- (a) ABCD              (b) BACD  
(c) BADC              (d) ABDC
- 24.** The initial configuration of queue is  $a, b, c, d$ . ‘ $a$ ’ is at the front. To get the configuration  $d, c, b, a$ . How many deletions and additions required :  
(a) 2 deletions, 3 additions  
(b) 3 deletions, 2 additions  
(c) 3 deletions, 4 additions  
(d) 3 deletions, 3 additions
- 25.** Which traversal techniques lists the nodes of a binary search tree in ascending order?  
(a) post-order         (b) in-order  
(c) pre-order          (d) linear-order
- 26.** The data unit in the TCP/IP application Layer is called a \_\_\_\_\_.  
(a) message            (b) segment  
(c) datagram          (d) frame
- 27.** Which of following file retrieval methods use hypermedia?  
(a) HTML               (b) Veronica  
(c) WAIS              (d) HTTP
- 28.** Which of following is an example of a client-server model :  
(a) DNS                (b) FTP  
(c) TELNET            (d) All of these
- 29.** \_\_\_\_\_ provide a method to recover data that has been delivered but not yet used :  
(a) Segmentation      (b) Concatenation  
(c) Transalation      (d) Synchronization
- 30.** Encryption and decryption are the functions of the \_\_\_\_\_ layer of OSI model :  
(a) transport          (b) session  
(c) router             (d) presentation
- 31.** The Register or main memory location which contains the effective address of the operand is known as :

- (a) Pointer  
 (b) Indexed register  
 (c) Special Locations  
 (d) Scratch Pad
- 32.** A Top-down Parse generates :  
 (a) Left most derivation  
 (b) Right-most derivation  
 (c) Right-most derivation in reverse  
 (d) Left-most derivation in reverse
- 33.** A general macroprocessor is an in built function of :  
 (a) Loader                   (b) Linker  
 (c) Editor                   (d) Assembler
- 34.** Which of the following is not collision Resolution Technique :  
 (a) Hash addressing  
 (b) Chaining  
 (c) Indexing  
 (d) None of these
- 35.** Which activities is not included in the first pass of two pass assembler?  
 (a) build the symbol table  
 (b) construct the Intermediate code  
 (c) separate mnemonic opcode and operand field.  
 (d) None of these
- 36.** Producer consumer problem can be solved using:  
 (a) semaphores           (b) event counters  
 (c) monitors              (d) All the above
- 37.** If you want to execute more than one program at a time, the systems software that are used must be capable of :  
 (a) word processing  
 (b) virtual memory  
 (c) compiling  
 (d) multitasking
- 38.** Which of the following checks cannot be carried out on the input data to a system  
 (a) Consistency check  
 (b) Syntax check  
 (c) Range check  
 (d) All the above
- 39.** Nonmodifiable procedures are called  
 (a) Serially usable procedure  
 (b) Concurrent procedure
- (c) Reentrant procedure  
 (d) Topdown procedure
- 40.** Banker's algorithm is used for \_\_\_\_\_ purpose:  
 (a) Deadlock avoidance  
 (b) Deadlock removal  
 (c) Deadlock prevention  
 (d) Deadlock continuations
- 41.** The testing of software against SRS is called  
 (a) Acceptance testing  
 (b) Integration testing  
 (c) Regression testing  
 (d) Series testing
- 42.** The lower degree of cohesion is :  
 (a) logical cohesion  
 (b) coincidental cohesion  
 (c) procedural cohesion  
 (d) communicational cohesion
- 43.** The Reliability of the software is directly dependent upon :  
 (a) Quality of the design  
 (b) Programmer's experience  
 (c) Number of error  
 (d) Set of user requirements
- 44.** Succesive layer of design in software using bottom-up design is called :  
 (a) Layer of Definement  
 (b) Layer of Construction  
 (c) Layer of abstraction  
 (d) None of the above
- 45.** Sliding window concept of software project management is :  
 (a) Preperation of comprehenciable plan  
 (b) Preperation of the various stages of development  
 (c) Ad-hoc planning  
 (d) Requirement analysis
- 46.** Which of the following transmission media is used in Bluetooth Technology :  
 (a) Radio links  
 (b) Microwave links  
 (c) VSAT Communication  
 (d) Fiber-optic
- 47.** Which of the following is a EDI standard?  
 (a) ANSI X.15              (b) ANSI X.14  
 (c) ANSI X.13              (d) ANSI X.12

48. Analysis of large database to retrieve information is called :  
 (a) OLTP                    (b) OLAP  
 (c) OLDP                    (d) TLPP
49. The cost of the network is usually determined by:  
 (a) Time complexity  
 (b) Switching complexity
- (c) Circuit complexity  
 (d) None of these
50. The mechanism with which several users can share a medium without interference is :  
 (a) Frequency modulation  
 (b) Amplitude modulation  
 (c) Multiplexing  
 (d) None of these



### ANSWERS

- |        |         |         |         |         |         |         |
|--------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 8. (c)  | 15. (b) | 22. (c) | 29. (d) | 36. (d) | 43. (c) |
| 2. (d) | 9. (a)  | 16. (d) | 23. (d) | 30. (d) | 37. (d) | 44. (c) |
| 3. (c) | 10. (b) | 17. (b) | 24. (d) | 31. (a) | 38. (b) | 45. (b) |
| 4. (a) | 11. (b) | 18. (b) | 25. (b) | 32. (a) | 39. (c) | 46. (a) |
| 5. (c) | 12. (d) | 19. (c) | 26. (a) | 33. (d) | 40. (a) | 47. (d) |
| 6. (a) | 13. (d) | 20. (a) | 27. (d) | 34. (c) | 41. (a) | 48. (b) |
| 7. (d) | 14. (b) | 21. (b) | 28. (d) | 35. (d) | 42. (b) | 49. (b) |
|        |         |         |         |         |         | 50. (c) |

### EXPLANATIONS

**1. (d)**

If a graph  $G$  with  $n$  vertices and  $(n - 1)$  edges with connected node then graph will be minimal connected. So, it can not be cycle and every pairs of vertices in graph is connected by exactly one path. This is the property of a tree.

**2. (d)**

From the union  $\neg P \rightarrow Q$ , we can conclude that  $P \vee Q$ .  
 So,  $P$  can be true or false,  $Q$  also can be true or false, i.e., nothing can be said about its value.

$$\begin{aligned} &= \neg P \vee (P \rightarrow Q) \\ &= \neg P \vee (\neg P \vee Q) \\ &= \neg P \vee Q \end{aligned}$$

Since, nothing can be said about the truth value of  $P$  or  $Q$  it implies that  $\neg P \vee Q$  can also be true or false.

Hence, the value can not be determined.

**3. (c)**

Generally,

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$P(A \cap B)$  can be zero or more than zero when it more than zero

$$P(A \cup B) < P(A) + P(B) \quad \text{when it is zero}$$

$$P(A \cup B) = P(A) + P(B)$$

we concluded that

$$P(A \cup B) \leq P(A) + P(B)$$

Arbitrary events does not mean it is also independent, so

$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

$$\text{or } P(B/A) = \frac{P(A \cap B)}{P(A)}$$

$$\begin{aligned} \text{so } P(A \cap B) &= P(A/B) \times P(B) \\ &= P(B/A) \times P(A) \end{aligned}$$

**4. (a)**

$$\begin{aligned} A &\rightarrow d \mid ccA \\ \Rightarrow A &\rightarrow (cc)^*d \end{aligned}$$

Substitute in,

$$\begin{aligned} S &\rightarrow d \mid bA \text{ to give} \\ S &\rightarrow d \mid b(cc)^*d \end{aligned}$$

$$L(G) = b(cc)^*d + d$$

Only (a)  $bcccccd$  can be generated by above regular expression.

5. (c)

Regular expression  $a+b$  means either  $a$  or  $b$  can be accepted only this can be written as  $\{a, b\}$  also.

6. (a)

- (a)  $(100101100)_2 = (300)_{10}$
- (b)  $(1110001110001)_2 = (7281)_{10}$
- (c)  $(11110011)_2 = (243)_{10}$
- (d)  $(101010101010)_2 = (10922)_{10}$

$$300/4 = 75$$

$$7281/4 = 1820.25$$

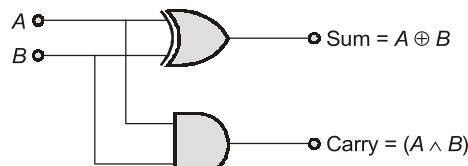
$$243/4 = 60.75$$

$$10922/4 = 2730.5$$

Checking last 3 binary bits 100. If any number contain last 3 bit 100 then always divisible by 4(100).

7. (d)

Half adder



| Input | Output |
|-------|--------|
| A     | S      |
| B     | C      |
| 0     | 0      |
| 0     | 1      |
| 1     | 0      |
| 1     | 1      |

Sum (adder) is used EX-OR circuit.

8. (c)

Assume  $a$  and  $b$  are some binary number.

$$a = 10101110$$

$$b = 10001010$$

$$(i) \quad a = a \oplus b = 00100100$$

$$(ii) \quad b = a \oplus b = 10101110$$

$$(iii) \quad a = a \oplus b = 10001010$$

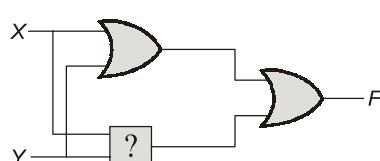
New value

$$a = 10001010$$

$$b = 10101110$$

So, it swaps value of  $a$  and  $b$ .

9. (a)



$$f = ((x + y) + (x ? y))$$

$$(a) \quad f = ((x + y) + (\bar{x} \cdot y))$$

$$= (x + y) + \bar{x} + \bar{y} = 1$$

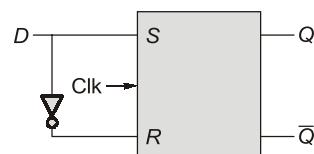
$$(b) \quad f = ((x + y) + (x \cdot y)) = x + y$$

$$(c) \quad f = ((x + y) + (x + y)) = x + y$$

$$(d) \quad f = ((x + y) + (x \oplus y))$$

$$= ((x + y) + x\bar{y} + \bar{x}y) = x + y$$

10. (b)



Logic diagram.

11. (b)

Size of (3.14f) C compiler consider as float which size is 4.

Size of (3.14) and size of (3.141) C compiler consider as double which size is 8.

12. (d)

Binary equivalent.

If 35 is 100011 and 7 is 111.

$$\begin{array}{r} 100011 \\ \text{Bitwise OR} \quad 000111 \\ \hline 100111 \end{array}$$

Which decimal equivalent is

$$32 + 4 + 2 + 1 = 39$$

13. (d)

Data members of a class are by default private and also member function of a class are by default private.

14. (b)

**Function overloading** done compile time because before execution of program compiler decides the flow of program (i.e., which form will be used during runtime. It also done at runtime.

15. (b)

Given, int  $f = 11, i = 3;$

$$i+ = (f > 3)? i \& 2: 5;$$

$$\Rightarrow i+ = (f > 3)? i \& 2: 5$$

$$\Rightarrow i+ = (11 > 3)? i \& 2: 5$$

$$\Rightarrow i+ = (11 > 3)? \text{is true so } i+= i \& 2$$

$$\Rightarrow i+ = 1011 \& 0010 \text{ which is } 2.$$

$$\begin{aligned} \text{So, } i+ &= 2 \\ \Rightarrow i &= i + 2 = 3 + 2 = 5 \end{aligned}$$

16. (d)

A database generally stores its schema in a data dictionary. Although a schema is defined in text database language, the term is often used to refer to a graphical depiction of the database structure. In other words, schema is the structure of the database that defines the objects in the database.

17. (b)

**CODASYL** is an acronym for “conference/committee on data systems languages”. This was consortium formed in 1959 to guide the development of a standard programming language that could be used on many computers. The effort led to the development of COBOL and other standards.

18. (b)

**A domain** is defined as the set of all unique values permitted for an attribute. For example, a domain of date is the set of all possible valid dates, a domain of integer is all possible whole numbers, a domain of day of week is Monday, Tuesday,... Sunday. This in effect is defining rules for a particular attribute.

19. (c)

- **Embedded pointers** are pointers that are embedded in data structures such as arrays, structures and unions. When embedded pointers only write output to a buffer and are null on input, the server application can change their values to non-null. In this case, the client stubs allocate new memory for this data.
- **Embedded pointer** is a pointer set in a data record instead of in directory.

20. (a)

**File locking** is a mechanism that restrict access to a computer file by allowing only one user or process access at any specific time.

21. (b)

An **AVL tree** is a self-balancing binary search tree. It was the first such data structure to be invented. In an AVL tree, the heights of the two child subtrees of any node differ by at most one;

if at any time they differ by more than one, rebalancing is done to restore this property.

22. (c)

Given hash function

$$f(\text{key}) = (\text{key}) \bmod 7$$

with linear probing and keys are:

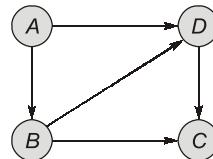
37, 38, 72, 48, 98, 11, 56

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| 0  | 1  | 2  | 3  | 4  | 5  | 6  |
| 98 | 56 | 37 | 38 | 72 | 11 | 48 |

So, location of element 11 is 5.

23. (d)

Given graph is



A **topological sort** or **topological ordering** of a directed graph is a linear ordering of its vertices such that for every directed edge  $uv$  from vertex  $u$  to vertex  $v$ ,  $u$  comes before  $v$  in the ordering. So, topological ordering of given graph is  $ABDC$ .

24. (d)

A **queue** is set up as FIFO (First-in, First-out). Therefore, since ‘a’ is the first one in the queue, ‘a’ has to be the first one out.

So, if ‘d’ has to be the first one in the queue, the three items that come in front of ‘d’ have to be removed.

There are 3 deletion of  $a, b, c$  and 3 insertion of  $c, b, a$ .

25. (b)

**Inorder traversal** of a binary search tree gives always **sorted order**.

26. (a)

**Protocol data unit (PDU)** is known as at various layer as:

1. Physical layer – bit.
2. Data link layer – frame.
3. Network layer – Packet.
4. Transport layer – Segment/datagram.
5. Application layer – Message.

27. (d)

- **The Hyper Text Transfer Protocol (HTTP)** is an application protocol for distributed, collaborative, hyper media information systems. HTTP is the foundation of data communication for the world wide web.
- **Hypertext** is structure text that uses logical links (hyperlinks) between nodes containing text.
- **HTML** is a markup language.

28. (d)

- The **domain name system** is maintained by a distributed database system, which uses the client-server model.
- The **file transfer protocol (FTP)** is a standard network protocol used to transfer computer files between a client and server on a computer network.
- **Telnet** is a client-server protocol, based on a reliable connection-oriented transport.

29. (d)

**Data synchronization technologies** are designed to synchronize a single set of data between two or more devices, automatically copying changes back and forth. Data synchronization can be local synchronization where the device and computer are side-by-side and data is transferred.

30. (d)

7 layers of OSI model:

1. **Application layer:** Message format, Human-machine interfaces.
2. **Presentation layer:** Coding into 1's and 0's; encryption and decryption.
3. **Session layer:** Authentication, permissions, session restoration.
4. **Transport layer:** End-to-end error control.
5. **Network layer:** Network addressing; routing or switching.
6. **Data link layer:** Error detection, flow control on physical link.
7. **Physical layer:** Bit stream, physical medium, method of representing bits.

31. (a)

The register or memory location that contains the effective address of the operand is a pointer.

When an execution takes place in such mode, instruction may be told to go to a specific address once, it is there, instead of finding an operand, it finds an address where the operand is located.

32. (a)

**Top-down parsing** can be viewed as an attempt to find left-most derivations of an input stream by searching for parse-tree using a top-down expansion of the given formal grammar rules. Simple implementation of top-down parsing do not terminate for left recursive grammars.

33. (d)

An **assembler** is a program that takes basic computer instructions and converts them into a pattern of bits that the computer's processor can use to perform its basic operations. Some people call these instructions assembler language and others use the term assembly language.

34. (c)

Both **Hash addressing** and **chaining** are collision resolution technique.

But an **index** is data structure defined on columns in a database table to significantly speed up data retrieval operations. An index is a small copy of a database table sorted by key values.

35. (d)

First pass of compiler includes:

- (i) Build the symbol table.
- (ii) Construct the intermediate code.
- (iii) Separate mnemonic opcode and operand field.

36. (d)

Producer consumer problem can be solved using:

- **Semaphores:** Semaphores solve the problem of producer and consumer. In the solution we use two semaphores, full count and empty count to solve the problem.
- **Monitors:** Since mutual exclusion is implicit with monitors, no extra effort is necessary to protect the critical section.
- Without semaphores or monitors using count variable.

37. (d)

**Multitasking** refers to an operating system in which multiple processes, also called tasks, can execute (i.e., run) on a single computer

simultaneously and without interfering with each other.

38. (b)

- A **consistency check** is a test performed to determine if the data has any internal conflict. So, it is not check anything about semantics.
- **The syntax** refers to grammatical structure.
- **A range check** is a check to make sure a number is within a certain range; for example, to ensure that a value about to be assigned to 16-bit integer is within the capacity of a 16-bit integer (i.e., checking against wrap-around).

39. (c)

- **A reentrant procedure** is one in which a single copy of program code can be shared by multiple users during the same period of time.
- **Re-entrancy** for multiprogrammed time-sharing-system. Reentrancy has 2 key aspects.
  1. The program code cannot modify itself.
  2. The local data for each user process must be stored separately.

40. (a)

**The Banker's algorithm** sometimes referred to as the avoidance algorithm is a resource allocation and deadlock avoidance algorithm developed by Dijkstra.

41. (a)

- **User acceptance testing** is also called beta testing, application testing, and/or end user testing is a phase of software development in which the software is tested in the "real world" by the intended audience or business representation.
- **Integration testing** is the phase of software testing in which individual software modules are combined and tested as a group. It occurs after unit testing and before validation testing.
- **Regression testing** is a type of software testing that seeks to uncover new software bugs, or regressions, in existing functional and non-functional areas of a system after changes such as enhancements, patches or

configuration changes, have been made to them.

- **A software requirements specification (SRS)** is a description of a software system to be developed. It lays out functional and non-functional requirements, and may include a set of use cases that describe user interactions that the software must provide.

42. (b)

- **Cohesion** refers to the degree to which the elements of a module belong together.
- **Cohesion** is an ordinal type of measurement and usually described as "high cohesion" or "low cohesion". The different degree of cohesion in order.

|               |                                                         |
|---------------|---------------------------------------------------------|
| High cohesion | Functional<br>Sequential<br>Communication<br>Procedural |
| Low cohesion  | Temporal<br>Logical<br>Coincidental                     |

43. (c)

**Software reliability** is measured in terms of mean time between failures. Reliability increases when errors or bugs from the program are removed.

44. (c)

- **Bottom-up design** is starting at the bottom, i.e., the virtual machine provide by development environemt-one builds up successively more powerfull layers. The upper most of these layers, which is the only one directly accessible to the applications developer, provides such powerful functionality that writting the final application is relatively straight forward.
- This methodology emphasized flexibility and reuse, and of course, integrates perfectly with bottom-up strategies for, implementation and testing.

That is called layer of abstraction.

45. (b)

Project planning requires almost core and attentions since commitment to unrealistic time and resource estimates result in schedule

slippage. This technique of staggered planning is known as sliding window planning.

46. (a)

- **Radio links protocol** is an automatic repeat request (ARQ) fragmentation protocol used over a wireless (typical cellular) air interface. Most wireless air interfaces are tuned to provide 1% packet loss, and most vocoders are mutually tuned to sacrifice very little voice quality at 1% packet loss.
- **A microwave link** is a communications system that uses a beam of radio waves in the microwave frequency range to transmit information between two fixed location on the earth.
- **VSAT (Very Small Aperture Terminal)** is a satellite communications system that serve home and business users.
- **A fiber optic cable** consists of a bundle of glass threads, each of which is capable of transmitting message modulated onto light waves.

47. (d)

**Electronic Data Interchange (EDI)** is an electronic communication method that provides standards for exchanging data via any electronic means.

The US standard ANSI ASC X.12 (X12) is predominant in north America.

48. (b)

- **Online analytical processing** or OLAP is an approach to answering multi-dimensional analytical (MDA) queries swiftly.
- The term **OLAP** was created as a slight modification of the traditional database term online transaction processing (OLTP).

49. (b)

In theoretical computer Science, circuit complexity is a branch of computational complexity theory in which boolean functions are classified according to the size or depth of boolean circuits that compute them.

50. (c)

- **Multi-plexing** is a method by which multiple analog or digital signals are combined into one signal over a shared medium. The aim is to share an expensive resource. For example, in telecommunications, several telephone calls may be carried using one wire.
- **Modulation** is varying the properties of a carrier signal to send informations, whereas multiplexing is a way of combining multiple signals. Both functionalities are essential for successful networking.

