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UGC-NET Previous Solved Papers : Computer Science and Applications

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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.

B. Singh (Ex. IES)

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.

With Best Wishes

B. Singh

CMD, MADE EASY Group

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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) Idempotant 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*) Z_{23}
   (*ii*) Z_{29}
   (*iii*) Z_{31}
   (*iv*) 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 O× 5AB6 and O× 61CD respectively. The result (in hex) of applying bitwise operator AND to x and y will be :
    (a) O× 5089
    (b) O× 4084
    (c) O× 78A4
    (d) O× 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 $\rightarrow$ 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, Hash(*y*) = X mode 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 suties
    (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, $fof(x) = x+2$
   $fofof(x) = x+3$
   $fofofof(x) = x+4 = (x+3)+1$
   $fofofof(x) = g(x)+1$

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, substract, 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 impedence 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.

$(x * y) * z = x * (y * z)$ for all x, y, z in S.

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

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

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

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

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:
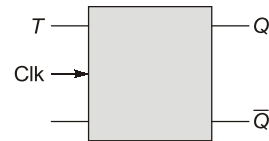
Characteristic equation:

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

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

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

Option (a) is true.

11. **(b)**

$O \times 5AB6 = 0101\ 1010\ 1011\ 0110$

$O \times 61CD = 0110\ 0001\ 1100\ 1101$

$AND = 0100\ 0000\ 1000\ 0100$

$\quad\quad = O \times 4084$

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.,
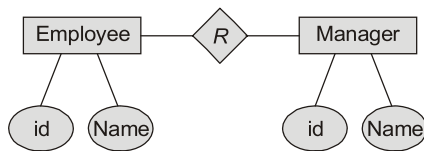
17. **(a)**

- **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 conjuction with its attributes to create a primary key. The foreign key is typically a primary key of an entity it is related to.
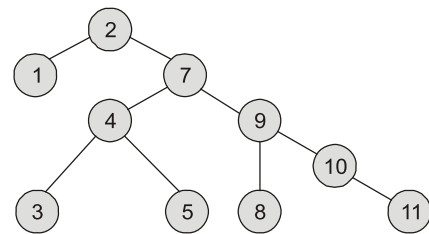
20. **(b)**

- **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 than sudenly 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 through 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 perform 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 perform 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 there 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 on 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, business and 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.

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