

UGC NET PAPER 2 JANUARY 22, 2017 SHIFT 1 COMPUTER SCIENCE AND APPLICATIONS QUESTION PAPER

**Note :** This paper contains **fifty (50)** objective type questions of **two (2)** marks each.

**All** questions are compulsory.

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  $F_{00}$  ?

(1) (1, 110, 1200)

(2) (1, 110, 600, 1200)

(3) (1, 2, 55, 110, 600, 1200)

(4) (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  | b   | c   | d  |
|-----|----|-----|-----|----|
| (1) | i  | ii  | iii | iv |
| (2) | i  | iii | iv  | ii |
| (3) | ii | iii | iv  | i  |
| (4) | ii | i   | iii | iv |

3. The functions mapping  $\mathbb{R}$  into  $\mathbb{R}$  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 :

$h \circ g(x)$  and  $h \circ g \circ f(x)$

- (1)  $(x^2 + 1)^4$  and  $[(x^3 - 4x)^2 + 1]^4$
- (2)  $(x^2 + 1)^4$  and  $[(x^3 - 4x)^2 + 1]^{-4}$
- (3)  $(x^2 + 1)^{-4}$  and  $[(x^2 - 4x)^2 + 1]^4$
- (4)  $(x^2 + 1)^{-4}$  and  $[(x^3 - 4x)^2 + 1]^{-4}$

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

0 and 100 and -6 and 34

- (1) 16 and 6
- (2) 17 and 6
- (3) 17 and 7
- (4) 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 ?

- (1)  $\deg(v) \geq \frac{n}{2}$  for each vertex  $v$ .
- (2)  $|E(G)| \geq \frac{1}{2}(n-1)(n-2) + 2$
- (3)  $\deg(v) + \deg(w) \geq n$  whenever  $v$  and  $w$  are not connected by an edge.
- (4) All of the above

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

$$\frac{\frac{(P \rightarrow Q) \wedge (R \rightarrow S)}{P \vee R}}{Y}$$

$Y$  is the premise :

- (1)  $P \vee R$
- (2)  $P \vee S$
- (3)  $Q \vee R$
- (4)  $Q \vee S$

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 \_\_\_\_.

- (1) Race condition (2) Saturation  
(3) Delay (4) 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.  $J_1 = K_1 = \bar{Q}_0$

V.  $J_2 = K_2 = Q_1 Q_0$

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

- (1) I, III, V (2) I, IV, VI  
(3) II, III, V (4) II, IV, VI

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

- (1) 0.5100098 (2) 0.2096  
(3) 0.52 (4) 0.4192

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

- (1) 2EE (2) 2FF  
(3) 4EF (4) 4FE

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

- (1) Constant (2) Structure  
(3) Array (4) Header file

- 12.** Which one of the following is correct for overloaded functions in C++ ?
- (1) Compiler sets up a separate function for every definition of function.
  - (2) Compiler does not set up a separate function for every definition of function.
  - (3) Overloaded functions cannot handle different types of objects.
  - (4) Overloaded functions cannot have same number of arguments.
- 13.** Which of the following storage classes have global visibility in C/C++ ?
- (1) Auto
  - (2) Extern
  - (3) Static
  - (4) Register
- 14.** Which of the following operators cannot be overloaded in C/C++ ?
- (1) Bitwise right shift assignment
  - (2) Address of
  - (3) Indirection
  - (4) Structure reference
- 15.** If X is a binary number which is power of 2, then the value of  $X \& (X - 1)$  is :
- (1) 11....11
  - (2) 00.....00
  - (3) 100.....0
  - (4) 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 spaces and B has \_\_\_\_\_ memory spaces.
- (1) 20, 20
  - (2) 3, 20
  - (3) 3, 4
  - (4) 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 Instructor Id No. being primary key.
  - (B) No two citizens have same Adhar-Id.
  - (C) Budget of a company must be zero.
- (1) (A), (B) and (C) are true.
  - (2) (A) false, (B) and (C) are true.
  - (3) (A) and (B) are true; (C) false.
  - (4) (A), (B) and (C) are false.
18. Let M and N be two entities in an 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 \_\_\_\_\_.
- (1) 4
  - (2) 6
  - (3) 7
  - (4) 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 \_\_\_\_\_.
- (1) Dependency preserving but not lossless join
  - (2) Dependency preserving and lossless join
  - (3) Lossless join but not dependency preserving
  - (4) Neither dependency preserving nor lossless join.

20. The order of a leaf node in a B<sup>+</sup> 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 \_\_\_\_\_.

- (1) 16                                      (2) 63  
(3) 64                                      (4) 65

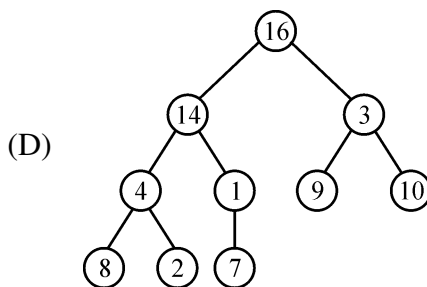
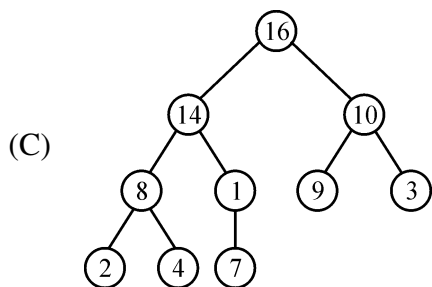
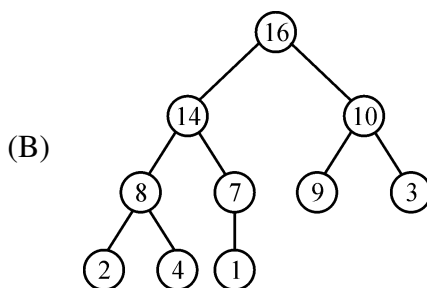
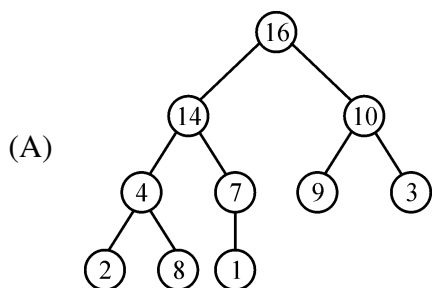
21. Which of the following is true for computation time in insertion, deletion and finding maximum and minimum element in a sorted array ?

- (1) Insertion – 0(1), Deletion – 0(1), Maximum – 0(1), Minimum – 0(1)  
(2) Insertion – 0(1), Deletion – 0(1), Maximum – 0(n), Minimum – 0(n)  
(3) Insertion – 0(n), Deletion – 0(n), Maximum – 0(1), Minimum – 0(1)  
(4) 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 \_\_\_\_\_.

- (1) A                                       (2) B  
(3) F                                       (4) G

23. Which of the following is a valid heap ?



- (1) A                                      (2) B  
(3) C                                      (4) 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 \_\_\_\_\_.

- (1) 1  
(2)  $1/n$   
(3)  $1/m$   
(4)  $n/m$

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.

- (1) A  
(2) B  
(3) C  
(4) D

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

- a. Application layer      i. TCP  
b. Transport layer      ii. IP  
c. Network layer      iii. PPP  
d. Datalink layer      iv. HTTP

**Codes :**

- |     | a   | b   | c  | d   |
|-----|-----|-----|----|-----|
| (1) | iv  | i   | ii | iii |
| (2) | iii | ii  | i  | iv  |
| (3) | ii  | iii | iv | i   |
| (4) | iii | i   | iv | ii  |

27. The maximum size of the data that the application layer can pass on to the TCP layer below is \_\_\_\_\_.
- (1)  $2^{16}$  bytes (2)  $2^{16}$  bytes + TCP header length  
(3)  $2^{16}$  bytes – TCP header length (4)  $2^{15}$  bytes
28. A packet whose destination is outside the local TCP/IP network segment is sent to \_\_\_\_\_.
- (1) File server (2) DNS server  
(3) DHCP server (4) Default gateway
29. Distance vector routing algorithm is a dynamic routing algorithm. The routing tables in distance vector routing algorithm are updated \_\_\_\_\_.
- (1) automatically  
(2) by server  
(3) by exchanging information with neighbour nodes  
(4) with back up database
30. In link state routing algorithm after construction of link state packets, new routes are computed using :
- (1) DES algorithm (2) Dijkstra's algorithm  
(3) RSA algorithm (4) 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
- (1) I, III and VI only (2) IV, V and VI only  
(3) II, IV and V only (4) 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 ?

- |           |           |
|-----------|-----------|
| (1) 0270H | (2) 0170H |
| (3) 01E0H | (4) 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 ?

- |                   |                      |
|-------------------|----------------------|
| (1) Only I        | (2) Only II          |
| (3) Both I and II | (4) 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

- (1) AL = 0FH; CF = 1; SF = 1
- (2) AL = F0H; CF = 0; SF = 0
- (3) AL = F1H; CF = 1; SF = 1
- (4) 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.
- (1) Only I
  - (2) Only II
  - (3) Both I and II
  - (4) 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)  $P_2$  needs to access
- (b)  $P_1$  needs to access
- (c)  $P_3$  needs to access
- (d)  $P_2$  exits critical section
- (e)  $P_1$  exits critical section

The final value of semaphore will be :

- (1) 0
- (2) 1
- (3) -1
- (4) -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 :

- (1) 48ns (2) 147ns  
(3) 120ns (4) 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   | b   | c  | d   |
|-----|-----|-----|----|-----|
| (1) | iii | iv  | i  | ii  |
| (2) | ii  | i   | iv | iii |
| (3) | iv  | i   | ii | iii |
| (4) | i   | iii | iv | 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

- (1) a, c and e (2) c, d and e  
(3) b, d and e (4) b, c and d

- 40.** Distributed operating systems consist of :
- (1) Loosely coupled O.S. software on a loosely coupled hardware.
  - (2) Loosely coupled O.S. software on a tightly coupled hardware.
  - (3) Tightly coupled O.S. software on a loosely coupled hardware.
  - (4) Tightly coupled O.S. software on a tightly coupled hardware.
- 41.** Software Engineering is an engineering discipline that is concerned with :
- (1) how computer systems work.
  - (2) theories and methods that underlie computers and software systems.
  - (3) all aspects of software production
  - (4) all aspects of computer-based systems development, 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 ?
- (1) Ability to undergo change
  - (2) Adaptability to new environments
  - (3) Operational characteristics
  - (4) 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.
- (1) Only S1 and S2
  - (2) Only S3
  - (3) All of S1, S2 and S3
  - (4) Only S1

44. The prototyping model of software development is :

- (1) a reasonable approach when requirements are well-defined.
- (2) a useful approach when a customer cannot define requirements clearly.
- (3) the best approach to use for projects with large development teams.
- (4) 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 :

- |                |               |
|----------------|---------------|
| (1) Adapter    | (2) Decorator |
| (3) Delegation | (4) 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   | b   | c   | d  |
|-----|-----|-----|-----|----|
| (1) | i   | ii  | iii | iv |
| (2) | i   | iii | ii  | iv |
| (3) | iii | ii  | iv  | i  |
| (4) | ii  | iii | i   | iv |

47. \_\_\_\_\_ refers loosely to the process of semi-automatically analyzing large databases to find useful patterns.
- (1) Datamining (2) Data warehousing  
(3) DBMS (4) 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
- (1) (A) true; (B) false.  
(2) Both (A) and (B) are true.  
(3) Both (A) and (B) are false.  
(4) (A) false; (B) true.
49. In 3G network, W-CDMA is also known as UMTS. The minimum spectrum allocation required for W-CDMA is \_\_\_\_\_.
- (1) 2 MHz (2) 20 KHz  
(3) 5 KHz (4) 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.
- (1) (A), (B) and (C) are false.  
(2) (A) and (B) false; (C) true.  
(3) (A) and (B) true; (C) false.  
(4) (A) true ; (B) and (C) are false.
-