

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

TEST BOOKLET

A.P.(COMP. ENGG.)T.E.-2016

Time Allowed : 2 Hours]

[Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.
2. Write your Roll Number only in the box provided alongside.
Do not write anything else on the Test Booklet.
3. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
4. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :

(A) (B) ● (D)

5. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled. After the response has been marked in the ANSWER SHEET, no erasing/fluid is allowed.
6. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.
7. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
8. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
9. If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct.
10. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

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1. The language generated by the regular expression $(aa)^*(bb)^*b$ is :

(A) $(aabb)^n b$

(B) $a^{2n} b^{2n} b$

(C) $a^m b^n b$

(D) $a^{2m} b^{2n} b$

2. If x and i are variables and both initialized to 0, what will be the value of i at the end of the loop ?

```
while (x < 10000) {
```

```
    x = 2x;
```

```
    i = i + 1; }
```

(A) 5

(B) 6

(C) 7

(D) 8

3. The time required to push an element in a stack with linked implementation is :

(A) $O(1)$

(B) $O(\log_2 n)$

(C) $O(n)$

(D) $O(n \log_2 n)$

8. The minimum number of bits required to represent numbers in the range -28 to +31 is :
- (A) 5 (B) 6
(C) 7 (D) 8
9. In a database for railway reservation system, the attributes of a table are train-number, date, source, destination, and seats-available. The most appropriate primary key for the table is :
- (A) train-number
(B) train-number + date
(C) train-number + source
(D) train-number + destination
10. The operation which is commutative but not associative is :
- (A) AND (B) OR
(C) EX-OR (D) NAND
11. If 73_x (in base-x number system) is equal to 54_y (in base-y number system), the possible values of x and y are :
- (A) 8, 16 (B) 10, 12
(C) 9, 13 (D) 8, 11
12. The parser tools YACC (or Bison) builds up :
- (A) SLR parsing table
(B) LALR parsing table
(C) Canonical LR parsing table
(D) All of the above

13. Which of the following database operations do not require the participating tables to be union-compatible ?
- (A) Union (B) Intersection
(C) Difference (D) Join
14. An operating system contains 3 user processes each requiring 2 units of resource R. The minimum number of units of R such that no deadlocks will ever arise is :
- (A) 3 (B) 4
(C) 5 (D) 6
15. The rule that a value of a foreign key must appear as a value of some specific table is called a :
- (A) Referential constraint (B) Index
(C) Integrity constraint (D) Functional dependency
16. Which one of the following is a key factor for preferring B+ -trees to binary search trees for indexing database relations ?
- (A) Database relations have a large number of records
(B) Database relations are sorted on the primary key
(C) B+ -trees require less memory than binary search trees
(D) Data transfer from disk is in terms of blocks

17. CARRY, in a half-adder, can be obtained using :
- (A) AND gate (B) OR gate
(C) NOR gate (D) NAND gate
18. Which pair of the following regular expressions are equivalent ?
- (A) 0^* and $(00)^*$
(B) $(00)^*$ and $(00)^* 00$
(C) 0^* and $(00)^* (\epsilon + 0)$
(D) 0^* and $0 (00)^* (\epsilon + 0)$
19. Which of the following statements is false ?
- (A) All LL(1) grammars are also SLR(1) grammars
(B) All LL(1) grammars are also LR(1) grammars
(C) All LALR(1) grammars are also LR(1) grammars
(D) All SLR(1) grammars are also LR(1) grammars
20. Indicate which is a pre-emptive scheduling algorithm :
- (A) Round-robin (B) Shortest-job next
(C) Priority-based (D) All of these

21. The running time of an algorithm is given by :

$$T(n) = T(n - 1) + T(n - 2) - T(n - 3), \text{ if } n > 3$$

n , otherwise

the order of this algorithm is :

(A) 1

(B) n

(C) $\log n$

(D) $n \log n$

22. What will be output of the following program ?

```
#include<stdio.h>
```

```
int main( )
```

```
{
```

```
    int i = 0;
```

```
    for(; i <= 5; i++);
```

```
        printf("%d", i);
```

```
    return 0;
```

```
}
```

(A) 0, 1, 2, 3, 4, 5

(B) 5

(C) 1, 2, 3, 4

(D) 6

23. What will be output of the following program ?

```
#include<stdio.h>

void main( ) {

int i = 3;

int *j;

int **k;

j = &i;

k = &j;

printf ("%u %u %d", k, *k, **k);

}
```

- (A) Address, Address, 3
- (B) Address, 3, 3
- (C) 3, 3, 3
- (D) Compilation error

24. Let $r = 1(0 + 1)^*$, $s = 11^*0$, and $t = 1 * 0$ be three regular expressions.

Which of the following is *true* ?

- (A) $L(r) \subseteq L(s)$ and $L(s) \subseteq L(t)$
- (B) $L(s) \subseteq L(r)$ and $L(s) \subseteq L(t)$
- (C) $L(r) \subseteq L(s)$ and $L(t) \subseteq L(s)$
- (D) $L(s) \subseteq L(r)$ and $L(t) \subseteq L(s)$

25. Which of the following is (are) true about virtual memory systems that use pages ?
- I. The virtual address space can be larger than the amount of physical memory.
 - II. Programs must be resident in main memory throughout their execution.
 - III. Pages correspond to semantic characteristics of the program.
- (A) I only
(B) II only
(C) Both I and II
(D) Both I and III
26. The average number of comparisons in sequential search for the successful case is :
- (A) n (B) $(n + 1)/2$
(C) $n(n + 1)/2$ (D) n^2
27. The postorder traversal of some binary tree produced the sequence CDBFEA, and the inorder traversal of same tree produced the sequence CBDAFE. What will be the total number of nodes in its right subtree ?
- (A) 2 (B) 3
(C) 4 (D) None of these
28. In any undirected graph, the sum of degrees of all the nodes :
- (A) is equal to the number of nodes
(B) is twice the number of nodes
(C) is equal to the number of edges
(D) is twice the number of edges

32. A scheme in which the address specifies which memory word contains the address of the operand, is called :
- (A) Immediate addressing (B) Based addressing
(C) Direct addressing (D) Indirect addressing
33. In the Internet Protocol (IP) suite of protocols, which of the following best describes the purpose of Address Resolution Protocol ?
- (A) To translate web addresses to host names
(B) To determine the IP address of a given host name
(C) To determine the hardware address of a given host name
(D) To determine the hardware address of a given IP address
34. Error detection at the data link layer is achieved by :
- (A) Bit stuffing (B) Cyclic redundancy codes
(C) Hamming codes (D) All of these
35. The algorithm design technique used in the Quick Sort algorithm is :
- (A) Dynamic Programming (B) Backtracking
(C) Divide and Conquer (D) Greedy method
36. Shift of a register by one bit to left in binary code is equivalent to :
- (A) addition by 2 (B) subtraction by 2
(C) multiplication by 2 (D) division by 2

37. A Boolean operation $*$ is defined as $A * B = AB + A'B'$, then $A * A$ is :
- (A) A (B) B
(C) 0 (D) 1
38. The lexical analysis for a modern programming language such as Java needs the power of which one of the following machine models in a necessary and sufficient sense ?
- (A) Finite state automata
(B) Deterministic push down automata
(C) Non-deterministic push down automata
(D) Turing machine
39. Consider the following statements :
- (I) operator grammar can have two consecutive non-terminals
(II) left recursive grammar causes infinite loop in top-down parser
(III) an ambiguous grammar can be LL(1)
- (A) only (I) is true
(B) only (II) is true
(C) both (II) and (III) are true
(D) (I), (II) and (III) are all true
40. The maximum height of a B+ tree of order m with n key values is :
- (A) $\log_m (n)$ (B) $(m + n)/2$
(C) $\log_{m/2} (m + n)$ (D) None of these

41. Which one of the following is *true* statement ?
- (A) With finer degree of granularity of locking a high degree of concurrency is possible
 - (B) Locking prevents non-serializable schedules
 - (C) Locking cannot take place at field level
 - (D) An exclusive lock on data item X is granted even if a shared lock is already held on X
42. The Intel Pentium Pro-microprocessor uses 36 address lines to access memory. What is the maximum memory that it can support, in gigabytes ?
- (A) 16
 - (B) 32
 - (C) 64
 - (D) 128
43. An iterative process of system development in which requirements are converted to a working system that is continually revised through close work between an analyst and user is called :
- (A) Waterfall model
 - (B) Spiral model
 - (C) Prototyping
 - (D) None of these
44. In a modular software design, which of the following is desirable ?
- (A) Low cohesion and low coupling
 - (B) Low cohesion and high coupling
 - (C) High cohesion and low coupling
 - (D) High cohesion and high coupling

45. In a complete k-ary tree, every internal node has exactly k children. The number of leaf nodes in such a tree with n internal nodes is :
- (A) nk
 (B) $n(k - 1)$
 (C) $n(k - 1) - 1$
 (D) $n(k - 1) + 1$
46. Consider the following transition table of a finite automata :

δ	a	b
Start	q1	q0
q0	q1	q0
q1	q2	q1
q2	q3	q2
q3	q4	q3
q4	q4	q4

If the accepting state is q^4 , then which of the following strings will be accepted :

- (I) aaaaa
 (II) aabbaabbbbb
 (III) bbabababb
- (A) (I) and (II)
 (B) (II) and (III)
 (C) (I) and (III)
 (D) All of the above

47. Consider the following program :

```
#include<stdio.h>

int main( ) {

int i, limit;

float x, term = 1, sum = 1;

scanf ("%d %f", &limit, &x);

for (i = 1; i <= limit; i++) {

    term = term *x / i;

    sum = sum + term; }

printf ("Result = % f\n", sum);

return 0; }
```

The program computes the sum of which of the following series ?

- (A) $x+x^2/2+x^3/3+x^4/4+\dots$
- (B) $x+x^2/2!+x^3/3!+x^4/4!+\dots$
- (C) $1+x+x^2/2+x^3/3+x^4/4+\dots$
- (D) $1+x+x^2/2!+x^3/3!+x^4/4!+\dots$

48. In software testing, how the error, fault and failure are related to each other ?
- (A) Error leads to failure but fault is not related to error and failure
 - (B) Fault leads to failure but error is not related to fault and failure
 - (C) Error leads to fault and fault leads to failure
 - (D) Fault leads to error and error leads to failure
49. Given that $(292)_{10} = (1204)_x$ in some number system x . The base x of that number system is :
- (A) 2
 - (B) 8
 - (C) 10
 - (D) None of these
50. Leaves of which of the following trees are at the same level ?
- (A) Binary tree
 - (B) B-tree
 - (C) AVL-tree
 - (D) Expression tree
51. Which of the following algorithm has running time $\theta(n^2)$ in the worst case but $\theta(n \log n)$ on average ?
- (A) Bubble sort
 - (B) Merge sort
 - (C) Heap sort
 - (D) Quick sort

55. Find the number of 1's present in the binary representation of the following :

$$214 \times 5 + 32 \times 6 - 12 \times 8$$

- (A) 5 (B) 6
(C) 7 (D) 8

56. A relation in $\{1, 2, 3, 4, 5, 6\}$ is given by :

$$\{(1, 2), (2, 3), (3, 4), (4, 4), (4, 5)\}.$$

This relation is :

- (A) Reflexive but not symmetric and transitive
(B) Symmetric but not reflexive and transitive
(C) Transitive but not reflexive and symmetric
(D) Not reflexive, not symmetric and not transitive
57. $L = \{a^n b^n \mid n = 1, 2, \dots, 1000\}$ is

- (A) Regular Language
(B) Context-Free Language but not Regular
(C) Not Regular Language
(D) None of the above

58. Which one of the following is *not* related to software maintenance activity ?

- (A) Error correction
- (B) Adaptation
- (C) Establishing scope
- (D) Preventive measures

59. Find the proper match for the following :

- | | |
|-----------------------|----------------------------|
| (a) Data link layer | (i) Flow control |
| (b) Network layer | (ii) Node to node delivery |
| (c) Transport layer | (iii) Mail services |
| (d) Application layer | (iv) Routing |

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

60. If the expression $((2 + 3) * 4 + 5 * (6 + 7) * 8) + 9$ is evaluated with $*$ having precedence over $+$, then the value obtained is the same as the value of which of the following prefix expressions ?

(A) $+ + * + 2 3 4 * * 5 + 6 7 8 9$

(B) $+ * + + 2 3 4 * * 5 + 6 7 8 9$

(C) $* + + 2 3 4 * * 5 + + 6 7 8 9$

(D) $* + + + 2 3 4 * * 5 + 6 7 8 9$

61. Let A be a finite non-empty set with cardinality n . The number of subsets $S \subseteq A$ having odd cardinality is :

(A) $n/2$

(B) 2^n

(C) 2^{n-1}

(D) None of these

62. Let the language L consists of all strings that contain an equal number of a 's and b 's and is a context-free. And let M be the regular language a^*b^* .

Which of the following is (are) true ?

(I) $L \cap M$ is a context-free language

(II) $L \cap M$ is a regular language

(III) $L \cap M = \{a^n b^m \mid n \text{ is a positive integer less than integer } m\}$

(A) (I) only

(B) (II) only

(C) (I) and (II)

(D) (I) and (III)

65. A disk uses a bit string to record the occupancy or vacancy of its tracks, with 0 denoting vacant and 1 denoting occupied. A 32-bit segment of this string has the hexadecimal value D4FE2016. The percentage of occupied tracks for the disk, to the nearest percent, is :

(A) 22

(B) 35

(C) 47

(D) 54

66. Let S be the statement : for $i = 1$ to N do $V[i] = V[i] + 1$

Which of the following code fragments perform the same changes to V as the above statement S ?

I $i = 0;$

while $i \leq N$ do

begin $i = i + 1; V[i] = V[i] + 1$ end

II $i = 1;$

while $i < N$ do

begin $V[i] = V[i] + 1; i = i + 1$ end

III $i = 0;$

while $i < N$ do

begin $V[i + 1] = V[i + 1] + 1; i = i + 1$ end

(A) I only

(B) I and II

(C) III only

(D) I and III

67. Transport layer aggregates data from different applications into a single stream before passing it to :
- (A) Network layer
 (B) Data link layer
 (C) Application layer
 (D) Physical layer
68. Find the proper match for the following :
- | | |
|-------------------------|--------------------------------------|
| (a) Top-down parsing | (i) Unique derivation |
| (b) Bottom up parsing | (ii) Reverse of rightmost derivation |
| (c) Ambiguity | (iii) Multiple derivation |
| (d) Unambiguous grammar | (iv) Leftmost derivation |
- | | | | |
|----------|------|-------|-------|
| (a) | (b) | (c) | (d) |
| (A) (ii) | (iv) | (iii) | (i) |
| (B) (iv) | (ii) | (i) | (iii) |
| (C) (ii) | (iv) | (i) | (iii) |
| (D) (iv) | (ii) | (iii) | (i) |

69. In compilers, the equivalent quadruple form of the expression $x+y/z-w$ is :
- (A) (1) (+,x,y,t1) (2) (/ ,t1,z,t2) (3) (-,t2,w,t3)
- (B) (1) (/ ,y,z,t1) (2) (+,x,t1,t2) (3) (-,t2,w,t3)
- (C) (1) (+,x,y) (2) (/ ,(1),z) (3) (-,(2),d)
- (D) None of the above
70. The proposition $P \wedge (\neg P \vee Q)$ is :
- (A) Tautology
- (B) Contradiction
- (C) Logically equivalent to $P \wedge Q$
- (D) None of the above
71. Consider the following truth table :

P	Q	?
T	T	T
T	F	T
F	T	F
F	F	T

Which of the following is the proposition corresponding to the above table ?

- (A) $P \rightarrow Q$ (B) $\neg P \rightarrow Q$
- (C) $\neg P \rightarrow \neg Q$ (D) $\neg Q \rightarrow \neg P$

72. Which of the following data structure is typically used in traversing a graph by breadth first search ?
- (A) Stack (B) Queue
(C) Heap (D) None of these
73. An undirected graph has n nodes and its adjacency matrix is given by $n \times n$ square matrix whose diagonal elements are 0's and non-diagonal elements are 1's. Which of the following is correct for the graph ?
- (A) The graph has a unique minimum spanning tree of cost n
(B) The graph has a unique minimum spanning tree of cost $n-1$
(C) The graph has multiple minimum spanning trees each of cost n
(D) The graph has multiple minimum spanning trees each of cost $n-1$
74. In a relational database system, if D_1, D_2, \dots, D_n are the domains of n attributes then a relation (table) defined on these n attributes is a subset of :
- (A) $D_1 \times D_2 \times \dots \times D_n$
(B) $D_1 \cup D_2 \cup \dots \cup D_n$
(C) $D_1 \cap D_2 \cap \dots \cap D_n$
(D) None of the above

75. A property of normalization of relations which guarantees that functional dependencies are present in separate relations after decomposition is classified as :
- (A) Non-additive join property
 - (B) Inter-dependency preservation property
 - (C) Dependency preservation property
 - (D) Additive join property
76. Consider the following algorithm :

Algorithm A(r)

Input : Root r of a full (proper) binary tree

if r is a leaf then return 0

else {

 m ← A (left child of r)

 n ← A (right child of r)

 if m > n then return m + 1

 else return n + 1

}

What does the above algorithm compute ?

- (A) The height of the tree
- (B) The number of leaf nodes in the tree
- (C) The number of total nodes in the tree
- (D) None of the above

77. A certain quadratic time algorithm uses 400 elementary operations to process an input of size 10. What is the most likely number of elementary operations it will use if input size is 100 ?
- (A) 400 (B) 1600
(C) 40000 (D) 160000
78. In the case of bubble sort method, an approximation of the number of comparisons and exchanges to sort an array of size N is :
- (A) N^2 comparisons, N^2 exchanges
(B) N^2 comparisons, $N^2/2$ exchanges
(C) $N^2/2$ comparisons, N^2 exchanges
(D) $N^2/2$ comparisons, $N^2/2$ exchanges
79. The Inorder traversal of which of the following will yield a sorted list of elements :
- (A) Binary tree (B) Binary search tree
(C) Min Heap (D) Max heap
80. Consider a directed graph with 25 vertices, how many Boolean values will be needed to represent the graph using an adjacency matrix ?
- (A) 25 (B) 250
(C) 625 (D) 1025

81. Which of the following is tributary of the Yamuna river ?
- (A) Tons (B) Pabbar
(C) Giri (D) All of these
82. Near which town of Shimla District of H.P. is Tanu Jubbal lake ?
- (A) Jubbal (B) Kotkhai
(C) Rohru (D) Narkanda
83. According to 2011 census which district of H.P. has the highest density of population in the state ?
- (A) Una (B) Hamirpur
(C) Solan (D) Bilaspur
84. In which district of H.P. is Inder Qila National Park ?
- (A) Shimla (B) Chamba
(C) Kullu (D) Solan
85. How much discount is given to women in bus fare in the HRTC buses while travelling within the state ?
- (A) 10 percent (B) 20 percent
(C) 25 percent (D) 30 percent

86. When was *Bonded Labour System (abolition) Act* passed in H.P. ?
- (A) 1976 (B) 1981
(C) 1987 (D) 1993
87. Which was the biggest princely state (in area) among the Shimla Hill States ?
- (A) Keonthal (B) Bilaspur
(C) Rampur Bushahr (D) Jubbal
88. In which river basin is Sumez hydro-power project ?
- (A) Satluj (B) Yamuna
(C) Beas (D) Chenab
89. Which Raja of Kangra was conferred the title of Maharaja by Ahmad Shah Durrani ?
- (A) Sansar Chand (B) Ghamand Chand
(C) Anirudh Chand (D) Tegh Chand
90. Who founded the Himachal Lokhit Party (HILOPA) ?
- (A) Pandit Sukh Ram
(B) Dr. Salig Ram
(C) Thakur Ram Lal
(D) Maheshwar Singh

91. With which sport is Yogeshwar Dutt associated ?
- (A) Shooting (B) Kabaddi
(C) Wrestling (D) Boxing
92. In which district of J&K is Amarnath Shrine ?
- (A) Kulgam (B) Anantnag
(C) Rajban (D) Kathua
93. Which is the smallest state in India in terms of population ?
- (A) Mizoram (B) Goa
(C) Sikkim (D) Kerala
94. Which amendment of the Indian constitution provided for the formation of National Judicial Appointment Commission (that was later on struck down by the Supreme Court of India) ?
- (A) 93rd (B) 97th
(C) 98th (D) 99th
95. Which of the following is *not* included in National Heritage City Development and Augmentation Yojna (HRIDAY) of Government of India ?
- (A) Ajmer (B) Badami
(C) Kurukshetra (D) Dwarka

96. Which country is hosting the 2018 winter Olympics ?
- (A) Brazil (B) South Korea
(C) Japan (D) None of these
97. In which country is Ataturk airport where over 40 persons were killed in twin blasts followed by gun fire ?
- (A) United Arab Emirates (UAE)
(B) Saudi Arabia
(C) Turkey
(D) Iraq
98. Which day is observed as International Day of Happiness ?
- (A) March 20 (B) June 21
(C) September 15 (D) November 02
99. Which is the smallest (in area) independent state in the world ?
- (A) Nauru (B) Vatican City
(C) Samoa (D) San Marino
100. Approximately how much time did solar powered space-craft Juno take to inter Jupiter's orbit after taking off from earth ?
- (A) 5 weeks (B) 5 months
(C) 5 years (D) 8 years