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

TBC : AKG-AP(COMPUTER ENGG.)-2018-T.E.

Time Allowed : 2 Hours]   [Maximum Marks : 100

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS 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. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. *DO NOT* write **anything** else on the Test Booklet.

3. This Test Booklet contains **100** items (questions). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.

4. You have to mark all your responses ONLY on the separate Answer Sheet provided. No erasing/correction fluid is allowed.

5. All items carry equal marks.

6. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.

7. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.

8. Sheets for rough work are appended in the Test Booklet at the end.

9. **Penalty for wrong answers :**
THERE WILL BE PENALTY (NEGATIVE MARKING) FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
   (*i*) There are four alternatives for the answers to every question. For each question for which a wrong answer has been given by the candidate, **one-fourth (0.25)** of the marks assigned to that question will be deducted as penalty.
   (*ii*) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answer happen to be correct and there will be same penalty as above for that question.
   (*iii*) If a question is left blank i.e. no answer is given by the candidate, there will be **no penalty** for that question.

10. Use and carrying of Mobile Phone and Electronic Gadget is prohibited in the Examination Hall.

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1. Postorder traversal of a given binary search tree T produces the following sequence of keys 12, 19, 17, 24, 9, 39, 6, 97, 32. Which one of the following sequences of keys can be the result of an inorder traversal of the tree T ?

   (A) 97, 39, 32, 24, 19, 17, 12, 9, 6

   (B) 6, 9, 12, 17, 19, 24, 32, 39, 97

   (C) 6, 9, 12, 24, 39, 19, 17, 32, 97

   (D) 12, 9, 17, 6, 19, 39, 32, 97, 24

2. In a binary search tree, ... traversal will result in nodes arranged in ascending order.

   (A) Inorder

   (B) Polish

   (C) Reverse Polish

   (D) Depth first search

3. Consider a B$^+$-tree, in which the maximum number of keys in a node is 6. What is the minimum number of keys in any non-root node ?

   (A) 4

   (B) 2

   (C) 3

   (D) 5

4. Given an empty stack, after performing push (a), push (a), push (b), pop, pop, push (b), push (c), pop, pop, pop, push (d), push (a), push (a), push (b), pop, pop. What is the value of the top of the stack ?

   (A) (d)

   (B) (c)

   (C) (b)

   (D) (a)

5. What is the best case time complexity of insertion sort ?

(A) $\Omega(n)$

(B) $\Omega(\log n)$

(C) $\Omega(n^2)$

(D) $\Omega(n \log n)$

6. Which of the following options provides the increasing order of asymptotic complexity ?

(A) $O(\log(\log n))$, $O(\sqrt{n})$, $O(\log n)$, $O(n)$

(B) $O(\sqrt{n})$, $O(\log n)$, $O(\log(\log n))$, $O(n)$

(C) $O(\log n)$, $O(\sqrt{n})$, $O(\log(\log n))$, $O(n)$

(D) $O(\log(\log n))$, $O(\log n)$, $O(\sqrt{n})$, $O(n)$

7. How many perfect matching are there in a complete graph of 7 vertices ?

(A) 21

(B) 42

(C) 64

(D) 20

8. Let X be a problem that belongs to the class NP. Then which one of the following is TRUE ?

(A) X may be decidable

(B) If X is NP-Hard, then it is not NP-Complete

(C) If X can be deterministically in polynomial time, then $P \neq NP$

(D) There is polynomial time algorithm for X

9. Match all algorithms in Group 1 with their algorithmic techniques in Group 2.

Group 1	Group 2
P. Dijkstra Algorithm	1. Dynamic Programming
Q. Bellman Ford Algorithm	2. Divide & Conquer
R. Merge Sort Algorithm	3. Greedy Approach
S. Travelling Salesman Problem	4. Branch & Bound

Codes :

(A) P-1, Q-2, R-3, S-4

(B) P-3, Q-1, R-4, S-2

(C) P-3, Q-1, R-2, S-4

(D) P-1, Q-3, R-2, S-4

10. Consider the matrices P, Q and R with dimensions 5×4, 4×3 and 3×2 respectively. What is the minimum number of multiplications required to multiply the three matrices ?

(A) 90

(B) 64

(C) 120

(D) 60

11. What is the maximum length of longest common subsequence of strings "AQBRMCS" and "MQBARCO" ?

(A) 3

(B) 5

(C) 4

(D) None of the above

12. Which one of the following layer of OSI reference model HDLC Protocol is used ?

(A) Physical

(B) Data Link

(C) Transport

(D) Session

13. Quadrature Amplitude Modulation means changing both :

(A) Frequency and Phase of the carrier

(B) Amplitude and Phase of the carrier

(C) Frequency and Amplitude of the carrier

(D) Wavelength and Phase of the carrier

14. Which of the following is NOT used as private IP address ?

(A) 10.10.100.100

(B) 172.18.18.18

(C) 192.168.244.244

(D) 172.14.14.14

15. How many characters per sec (7 bits + 1 Parity) can be transmitted over a 2400 bps line if the transfer is synchronous (1 start and 1 stop bit) ?

(A) 240

(B) 250

(C) 300

(D) 320

16. In which of the following algorithmic techniques is/are used in Distance vector routing algorithm ?

(A) Bellman Ford algorithm

(B) Ford Fulkerson algorithm

(C) Both (A) and (B)

(D) None of the above

17. The address of a class B host is to be split into subnets with a 6 bit subnet number. What are the maximum number of subnets and maximum number of hosts in each subnet ?

(A) 64 subnets 1024 hosts

(B) 62 subnets 1022 hosts

(C) 64 subnets 256 hosts

(D) 62 subnets 254 hosts

18. Which of the following information does NOT contain in IPv4 packet format ?

(A) Payload length

(B) Identification

(C) Header Checksum

(D) Options

19. In Global Service for Mobile (GSM) each voice channel is digitized and compressed to a digital signal of :

(A) 18 kbps

(B) 24 kbps

(C) 12 kbps

(D) 13 kbps

20. How many 8 X 1 MUX required for implementation of 256 X 1 MUX ?

(A) 35

(B) 36

(C) 37

(D) 38

21. Assuming all numbers are in 2's complement representation, which of the following number is divisible by 11111011 ?

(A) 11011011

(B) 11010111

(C) 11100100

(D) 11100111

22. What is the result of Boolean expression X'Y' + XY + X'Y ?

(A) X' + Y'

(B) X + Y

(C) X' + Y

(D) X + Y'

23. The process that periodically checks status of an I/O device, is known as :

(A) Polling

(B) Dealing

(C) I/O instruction

(D) Cold swapping

24. In 8085, which of the following modifies the program counter ?

(A) PCHL instruction only

(B) ADD instructions only

(C) JMP and CALL instructions only

(D) All of the above instructions

25. Which register is used for temporary storing the address during CALL instruction in 8085 microprocessor ?

    (A) PC

    (B) SP

    (C) WZ

    (D) None of the above

26. In a two-pass assembler, the task of the pass II is to :

    (A) Separate the symbol, mnemonic opcode and operand fields

    (B) Synthesize the target program

    (C) Build the symbol table

    (D) Construct intermediate code

27. Which one of the following is non-vectored interrupt ?

    (A) INTR

    (B) RST 7.5

    (C) RST 6.5

    (D) TRAP

28. Which module gives control of the CPU to the process selected by the short term scheduler ?

    (A) Scheduler

    (B) Interrupt

    (C) Dispatcher

    (D) All of the above

29. In Linux, PID of the kernel process is :

    (A) Undefined

    (B) 2

    (C) 1

    (D) 0

30. How many $32K \times 1$ RAM chips are needed to provide a memory capacity of 256 K-bytes ?

    (A) 64

    (B) 128

    (C) 32

    (D) 8

31. A critical section is a program segment :

(A) Which should run in a certain specified amount of time

(B) Which avoids deadlock

(C) Which must be enclosed by a pair of semaphore operations, P and V

(D) Where shared resources are accessed

32. Which one of the following is NOT a communication command in Linux ?

(A) Wall

(B) Mail

(C) Mesg

(D) None of the above

33. Consider a system with TLB access time of 20 ns and main memory access time of 100 ns. Calculate the effective memory access time if TLB hit ratio is 80%.

(A) 140 ns

(B) 125 ns

(C) 130 ns

(D) 120 ns

34. In the...........algorithm, the disk arm goes as far as the final request in each direction, and then reverses direction immediately without going to the end of the disk.

(A) Scan

(B) Look

(C) C-Scan

(D) C-Look

35. Which of the following is the most appropriate format for graphics that are to be embedded within an Internet document ?

(A) JPEG

(B) HTML

(C) BMP

(D) GIF

36. How is comment given in XML document ?

(A) <?.....................>

(B) <!.....................>

(C) <!.....................!>

(D) </.....................>

37. Which one of the following is a high level abstraction over semaphore ?

(A) Message Passing

(B) Mutual Exclusion

(C) Shared Memory

(D) Monitor

38. Which of the following is a valid reason for causing degeneracy in a transportation problem ? Consider m is no. of rows and n is no. of columns in transportation table.

(A) When the number of allocation is greater than $m + n - 1$

(B) When the number of allocation is $m + n - 1$

(C) When the number of allocation is less than $m + n - 1$

(D) All of the above

39. What is the complexity of safe sequence using Banker's algorithm where m is the number of resources and n is the number of processes ?

(A) mn

(B) n^2

(C) mn^2

(D) $m^2 n$

40. Which of the following pairs have Different expressive power ?

   (A) Deterministic Finite Automata (DFA) and Non-Deterministic Finite Automata (NFA)

   (B) Deterministic Pushdown Automata (DPDA) and Non-Deterministic Pushdown Automata (NPDA)

   (C) Deterministic Single Tape Turing Machine and Non-Deterministic Single Tape Turing Machine

   (D) Single Tape Turing Machine and Multi-Tape Turing Machine

41. The family of Recursive languages is...............under intersection and ....under compliment.

   (A) closed, not closed

   (B) not closed, not closed

   (C) closed, closed

   (D) not closed, closed

42. Which one of the following strings can definitely be said to be a token without looking at the next input char ?

   (A) *

   (B) >

   (C) +

   (D) <

43. Which TWO of the following four regular expressions are equivalent ?

   I. $(00)^* (\varepsilon + 0)$

   II. $(00)^*$

   III. 0^*

   IV. $0(00)^*$

   (A) I and II

   (B) I and III

   (C) II and III

   (D) III and IV

P.T.O.

44. Which of the following languages over $\{a, b, c\}$ is NOT accepted by a Push Down Automata (PDA) ?

(A) $\{WCW^R \mid W \in \{a, b\}*\}$

(B) $\{WW^R \mid W \in \{a, b, c)*\}$

(C) $\{a^n b^n c^n \mid n \geq 0\}$

(D) $\{W \mid W$ is a palindrome over $\{a, b, c\}*\}$

45. Which of the following statements is TRUE ?

(A) Halting problem of Turing machines is decidable

(B) Given two arbitrary context-free grammars G1, G2 and it is decidable when L(G1) = L(G2)

(C) Given two regular grammars, G1, G2 and it is undecidable when L(G1) = L(G2)

(D) Determining whether a Recursive grammar for membership is decidable

46. Which of the following is most powerful parsing technique in compiler ?

(A) CLR

(B) LALR

(C) SLR

(D) LL(1)

47. Assume that the SLR(1) parser for a grammar G1 has $n1$ states and the LALR(1) parser for G2 has $n2$ states. The relationship between $n1$ and $n2$ is :

(A) $n1 = n2$

(B) $n1 > n2$

(C) $n1 < n2$

(D) $n1 \leq n2$

48. Match all items in Group 1 with correct options from those given in Group 2.

Group 1	Group 2
P. Regular Expression	1. Syntax analysis
Q. Data flow analysis	2. Lexical analysis
R. Pushdown automata	3. Code generation
S. Register allocation	4. Code optimization

Codes :

(A) P-2, Q-1, R-4, S-3

(B) P-2, Q-4, R-1, S-3

(C) P-1, Q-2, R-3, S-4

(D) P-1, Q-3, R-2, S-4

49. In an absolute loading scheme which loader function is accomplished by assembler ?

(A) Linker

(B) Loader

(C) Allocation

(D) Re-allocation

50. The number of equivalence relations on a set {1, 2, 3, 4, 5} is :

(A) 52

(B) 32

(C) 31

(D) 16

51. The time complexity of computing the transitive closure of a binary relation on a set of n elements is :

(A) $O(n)$

(B) $O(n^2)$

(C) $O(n^3)$

(D) $O(n \log n)$

52. Given the basic ER and relational models, which of the following statement is INCORRECT ?

(A) In a row of a relational table, an attribute can have more than one value

(B) An attribute of an entity can have more than one value

(C) In a row of a relational table, an attribute can have exactly one value or a NULL value

(D) An attribute of an entity can be composite

53. Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock ?

I. 2-phase locking

II. Time-stamp ordering

(A) I only

(B) II only

(C) Both I and II

(D) Neither I nor II

54. In an SQL query involving four clauses where, having, order by and group by, if a composite query is performed what is the order of evaluation of these clauses ?

(A) having followed by where followed by group by followed by order by

(B) where followed by group by followed by having followed by order by

(C) where followed by having followed by group by followed by order by

(D) where followed by group by followed by order by followed by having

55. The statement that is executed automatically by the system as a side effect of the modification of the database is :

(A) Recovery

(B) Assertion

(C) Trigger

(D) Backup

56. Consider the relations $r1(P, Q, R)$ and $r2(R, S, T)$ with primary keys P and R respectively. The relation $r1$ contains 2000 tuples and $r2$ contains 2500 tuples. The maximum size of the join $r1 \times r2$ is :

(A) 2000

(B) 2500

(C) 4500

(D) 3000

57. Data marts that incorporate data mining tools to extract set of data are called :

(A) Intra-Entry Data Mart

(B) Inter-Entry Data Mart

(C) Dependent Data Mart

(D) Independent Data Mart

58. Process of analyzing relational schema to achieve minimal redundancy and insertion or update anomalies is classified as :

(A) Isolation of data

(B) De-normalization of data

(C) Normalization of data

(D) Denomination of data

59. Rule which states that addition of same attributes to right side and left side results in other valid dependency is classified as :

(A) Augmenting Rule

(B) Referential Rule

(C) Inferential Rule

(D) Reflexive Rule

60. What kind of mechanism is to be taken into account for converting a weak entity set into strong entity set in entity-relationship diagram ?

(A) Specialization

(B) Adding Suitable Attributes

(C) Generalization

(D) Aggregation

61. What do you mean by data scrubbing in data warehousing ?

(A) A process to reject data from the data warehouse and to create the necessary indexes

(B) A process to upgrade the quality of data before it is moved into a data warehouse

(C) A process to upgrade the quality of data after it is moved into a data warehouse

(D) A process to load the data in the data warehouse and to create the necessary indexes

62. While estimating the cost of software, Lines of Code (LOC) and Function Points (FP) metrics are used to measure which one of the following ?

(A) Length of code

(B) Size of software

(C) Functionality of software

(D) None of the above

63. Which one of the following is NOT a step of requirement engineering ?

   (A) Requirement Elicitation

   (B) Requirement Analysis

   (C) Requirement Documentation

   (D) None of the above

64. Which one of the following is NOT a key process area in CMM level 5 ?

   (A) Technology Change Management

   (B) Defect Prevention

   (C) Process Change Management

   (D) Software Product Engineering

65. 53000 LOC gaming software is developed with the effort of 3 person-year. What is the productivity of person-month ?

   (A) 1.4 KLOC

   (B) 1.6 KLOC

   (C) 2.4 KLOC

   (D) 17.6 KLOC

66. Which of the following testing methods uses fault simulation technique ?

   (A) Unit Testing

   (B) Beta Testing

   (C) Mutation Testing

   (D) Stress Testing

67. Which of the following are the types of hidden surface removal algorithm ?

   (A) Scan line algorithm, Priority algorithm

   (B) Depth Conversion, Z-Buffer, Back Face Removal

   (C) BSP method, Area Subdivision method

   (D) All of the above

68. Which of the following line drawing algorithm based only on integer calculation ?

(A) Caman's line drawing algorithm

(B) Digital Differential Analyzer (DDA) line drawing algorithm

(C) Bresenham's line drawing algorithm

(D) All of the above

69. In Cohen-Sutherland line clipping algorithm, the region code 0010 represents the.......... ?

(A) Top Clipping Window

(B) Left Clipping Window

(C) Right Clipping Window

(D) Bottom Clipping Window

70. In Graphics, digitizing a picture definition into a set of intensity values is known as :

(A) Scan Conversion

(B) Digitization

(C) Scanning

(D) Refreshing

71. In JAVA, which of these access specifiers can be used for an interface ?

(A) Private

(B) Protected

(C) Public

(D) All of the above

72. Which of the following operations can be performed on the file "source.txt" using the code below in C langauge ?

FILE *fp;

fp = fopen("source.txt", "a+");

(A) Reading and Writing

(B) Writing and Appending

(C) Reading and Appending

(D) Appending Only

73. Which of the following statements is/are TRUE regarding JAVA ?

   (*i*) Constants that cannot be changed are declared using the 'static' keyword.

   (*ii*) A class can only inherit one class but can implement multiple interfaces.

   (A) Only (*i*) is True

   (B) Only (*ii*) is True

   (C) Both (*i*) and (*ii*) are True

   (D) Neither (*i*) nor (*ii*) is True

74. What is the output of the following C language code ?

   ```
   main ( )
   {
           int a;
           a= (50, 70, 60);
           printf("%d", a);
   }
   ```

   (A) 50

   (B) 60

   (C) 70

   (D) Compile time error

75. While overloading binary operators using member function in C++, it requires...................argument/s.

   (A) Zero

   (B) One

   (C) Two

   (D) Three

76. What will be the output of the following program in C Language in gcc compiler ?

   ```
   #include<stdio.h>
   int fun ()
   {
           puts("Hello");
           return 10;
   }
   int main ()
   {
           printf("%d", size of (fun ()));
           return 0;
   }
   ```

   (A) 4

   (B) Hello 4

   (C) 4 Hello

   (D) Compiler error

77. Match the List I with List II and select the CORRECT answer using the codes given below the lists :

List I	List II
A. Indirect addressing	1. Loops
B. Immediate Addressing	2. Pointers
C. Auto Decrement addressing	3. Constants

Codes :

(A) A-3, B-1, C-2

(B) A-3, B-2, C-1

(C) A-1, B-3, C-2

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

78. Which of the following is NOT a storage class specifier in C ?

(A) Typedef

(B) Auto

(C) Register

(D) Volatile

79. Which of the following in C++ is TRUE about pure virtual functions ?

(*i*) Their implementation is not provided in a class where they are declared.

(*ii*) If a class has a pure virtual function, then the class becomes abstract class and an instance of this class cannot be created.

(A) Only 1

(B) Only 2

(C) Both 1 and 2

(D) Neither 1 nor 2

80. What do you mean by collection in JAVA ?

(A) A group of Classes

(B) A group of Interfaces

(C) A group of Objects

(D) All of the above

81. Which Governor General was responsible for introducing "Doctrine of Lapse" theory ?

(A) Lord Dalhousie

(B) Henry Hardinge

(C) Lord Auckland

(D) Lord William Bentinck

82. World Trade Organization (WTO) was earlier known as :

(A) UNCTAD

(B) GATT

(C) GTFC

(D) MNC

83. How many subjects are there in the state list given in the Indian Constitution ?

(A) 90

(B) 47

(C) 66

(D) 75

84. The world's largest producer of jute is :

(A) Uzbekistan

(B) China

(C) India

(D) Nepal

85. From where did the founder of Bhajji state come ?

(A) Sirmaur

(B) Kangra

(C) Chamba

(D) Bikaner

86. Dr. Yashwant Singh Parmar died in :

(A) 1988

(B) 1978

(C) 1986

(D) 1981

87. In how many districts, was "National Urban Livelihood Mission launched in H.P. ?

(A) 7

(B) 8

(C) 9

(D) 10

88. Who is the present Secretary General of the U.N.O. ?

(A) Kofi Annan

(B) Ban Ki-Moon

(C) Antonio Guterres

(D) Kurt Waldheim

89. Yami Gautam, film star, was born in district of :

(A) Shimla

(B) Sirmaur

(C) Mandi

(D) Bilaspur

90. On which date was Congress launched at Bombay ?

(A) 20 December, 1984

(B) 20 June, 1885

(C) 28 December, 1885

(D) 18 July, 1885

91. When were Bhagat Singh, Sukhdev and Rajguru hanged ?

(A) 13 April, 1930

(B) 30 May, 1932

(C) 23 March, 1931

(D) 30 January, 1929

92. In which session of the Indian National Congress was Subhash Chandra Bose elected its President ?

(A) Bombay

(B) Haripura

(C) Jaipur

(D) Meerut

93. The second largest producer of Jute in the world is :

(A) Nepal

(B) China

(C) Bangladesh

(D) U.S.A.

94. When was (year), Sarkaria Commission constituted by the Union Govt. ?

(A) 1983

(B) 1978

(C) 1973

(D) 1989

95. In which year was the National Archieves of India set up ?

    (A) 1860

    (B) 1886

    (C) 1888

    (D) 1891

96. When was Gram Uday Se Bharat Uday Abhiyan launched ?

    (A) 14 April, 2016

    (B) 14 September, 2015

    (C) 31 September, 2014

    (D) 17 May, 2017

97. "Kishori Shakti Yojana" is a central sponsored scheme for empowerment of the adolescent girls in the age group of :

    (A) 9 – 18 years

    (B) 11 – 18 years

    (C) 12 – 20 years

    (D) 14 – 24 years

98. Which of the following districts recorded lowest voting turnout during 2017 Assembly Election in Himachal Pradesh ?

    (A) Kinnaur

    (B) Bilaspur

    (C) Hamirpur

    (D) Chamba

99. 'Matri Shakti Bima Yojna' covers all women living below the poverty line within the age group of :

    (A) 15 – 60 yeras

    (B) 20 – 65 years

    (C) 18 – 58 years

    (D) 10 – 75 years

100. When was United Nations International Children's Emergency Fund (UNICEF) established ?

    (A) 1946

    (B) 1950

    (C) 1955

    (D) 1961