Q.P. Code : 50305

(3 Hours) **[Total Marks : 100**

Section I

- All Questions are compulsory Section I

40

1 Minimal deterministic finite automaton for the language L={ 0^n | n≥0, n≠4 } will have: 1

(A) 1 final state among 5 states
(B) 4 final states among 5 states
(C) 1 final state among 6 states
(D) 5 final states among 6 states

2 The regular expression corresponding to the language L where 1
L={x∈{0,1}* | x ends with 1 and does not contain substring 00 } is:

(A) (1 + 01)* (10 + 01) (B) (1 + 01)* 01
(C) (1 + 01)* (1 + 01) (D) (10 + 01)* 01

3 The transition function for the language L = {w|n_a(w) and n_b(w) are both odd} is given by: 1

$\delta(q_0, a)=q_1$; $\delta(q_0, b)=q_2$
$\delta(q_1, a)=q_0$; $\delta(q_1, b)=q_3$
$\delta(q_2, a)=q_3$; $\delta(q_2, b)=q_0$
$\delta(q_3, a)=q_2$; $\delta(q_3, b)=q_1$

the initial and final states of the automata are:

(A) q_0 and q_0 respectively (B) q_0 and q_1 respectively
(C) q_0 and q_2 respectively (D) q_0 and q_3 respectively

4 The RST 7 instruction in 8085 microprocessor is equivalent to: 1

(A) CALL 0010 H (B) CALL 0034 H
(C) CALL 0038 H (D) CALL 003C H

5 The equivalent hexadecimal notation for octal number 2550276 is: 1

(A) FADED (B) AEOBE
(C) ADOBE (D) ACABE

6 The number of flip-flops required to design a modulo-272 counter is: 1

(A) 8 (B) 9
(C) 27 (D) 11

7 Let E_1 and E_2 be two entities in E-R diagram with simple single valued attributes. R_1 and R_2 are two relationships between E_1 and E_2 where R_1 is one-many and R_2 is many-many. R_1 and R_2 do not have any attributes of their own. How many minimum number of tables are required to represent this situation in the Relational Model? 1

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

8 Select the 'False' statement from the following statements about Normal Forms: 1

(A) Lossless preserving decomposition into 3NF is always possible

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(B) Lossless preserving decomposition into BCNF is always possible
(C) Any relation with two attributes is in BCNF
(D) BCNF is stronger than 3NF

9 The Relation 1
Purchase Order (P_no, P_ord_no, P_name, Qty_supplier, unit_price)
is in 2NF because :
(A) Non key attribute P_name is dependent on P_no which is part of composite key
(B) Non key attribute P_name is dependent on Qty_supplier
(C) key attribute Qty_supplier is dependent on primary_key unit price
(D) key attribute P_ord_no is dependent on primary_key unit price

10 The relation schemas R_1 and R_2 form a Lossless join decomposition of R if and only if: 1
(a) $R_1 \cap R_2 \rightarrow (R_1 - R_2)$
(b) $R_1 \rightarrow R_2$
(c) $R_1 \cap R_2 \rightarrow (R_2 - R_1)$
(d) $R_2 \rightarrow R_1 \cap R_2$
(A) (a) and (b) happens (B) (a) and (d) happens
(C) (a) and (c) happens (D) (b) and (c) happens

11 In the indexed scheme of blocks to a file, the maximum possible size of the file depends on: 1
(A) The number of blocks used for index, and the size of index
(B) Size of Blocks and size of Address
(C) Size of Index
(D) Size of Block

12 Give the number of principal vanishing point(s) along with their direction for the standard perspective Transformation: 1
(A) Only one in the direction K
(B) Two in the directions I and J
(C) Three in the directions I, J and K
(D) Only two in the directions J and K

13 The process of dividing an analog signal into a string of discrete outputs, each of constant amplitude, is called: 1
(A) Strobing (B) Amplification
(C) Conditioning (D) Quantization

14 Which of the following statements is/are incorrect? 1
(a) Mapping the co-ordinates of the points and lines that form the picture into the appropriate co-ordinates on the device or workstation is known as viewing transformation.
(b) The right handed Cartesian co-ordinates system in whose coordinates we describe the picture is known as world coordinate system.

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(c) The co-ordinate system that corresponds to the device or workstation where the image is to be displayed is known as physical device co-ordinate system.
(d) Left-handed co-ordinate system in which the display area of the virtual display device corresponds to the unit(|x|) square whose lower left handed corner is at origin of the co-ordinate system, is known as normalized device co-ordinate system.

(A) (a) only (B) (a) and (b)
(C) (c) only (D) (d) only

15 Minimal deterministic finite automaton for the language $L=\{ 0^n \mid n\geq 0, n\neq 4 \}$ will have: 1

(A) 1 final state among 5 states
(B) 4 final states among 5 states
(C) 1 final state among 6 states
(D) 5 final states among 6 states

16 The clausal form of the disjunctive normal form $\neg A \vee \neg B \vee \neg C \vee D$ is: 1

(A) $A \wedge B \wedge C \Rightarrow D$ (B) $A \vee B \vee C \vee D \Rightarrow$ true
(C) $A \wedge B \wedge C \wedge D \Rightarrow$ true (D) $A \wedge B \wedge C \wedge D \Rightarrow$ false

17 Which of the following is false for the programming language PROLOG? 1

(A) A PROLOG variable can only be assigned to a value once
(B) PROLOG is a Strongly Typed Language.
(C) The scope of a variable in PROLOG is a single clause or rule.
(D) the scope of a variable in PROLOG is a Single Query

18 Which transmission technique guarantees that data packets will be received by the receiver in the same order in which they were sent by the sender? 1

(A) Broadcasting (B) Unicasting
(C) Packet Switching (D) Circuit Switching

19 Which of the following control fields in TCP header is used to specify the sender has no more data to transmit? 1

(A) FIN (B) RST
(C) SYN (D) PSH

20 A message "COMPUTERNETWORK" encrypted(ignore quotes)using columnar transposition cipher with a key "LAYER". The encrypted message is: 1

(A) CTTOEWMROPNRUEK (B) MROUEKCTTPNROEW
(C) OEWPNRCTTUEKMRO (D) UEKPNRMROOEWCTT

21 Suppose a digitized voice channel is made by digitizing 8 kHz bandwidth analog voice signal. It is required to sample the signal at twice the highest frequency (two samples per hertz). What is the bit rate required, if it is assumed that each sample requires 8 bits? 1

(A) 32 kbps (B) 64 kbps
(C) 128 kbps (D) 256 kbps

22 An all-pairs shortest-paths problem is efficiently solved using: 1

(A) Dijkstra' algorithm (B) Bellman-Ford algorithm
(C) Kruskal Algorithm (D) Floyd-Warshall algorithm

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23 Which of the following time Complexity functions is asymptotically smaller? 1
(A) lg(lg*n) (B) lg*(lg n)
(C) lg(n!) (D) lg*(n!)

24 Consider a hash table of size m=100 and the hash function h(k) = floor(m(kA mod 1)) for A = $(\sqrt{5} - 1)/2 = 0.618033$. Compute the location to which the key k = 123456 is placed in hash table. 1
(A) 77 (B) 82
(C) 88 (D) 89

25 The number of nodes of height h in any n - element heap is 1
(A) h (B) z^h
(C) ceil(n/z^h) (D) ceil(n/z^{h+1})

26 Consider a Hamiltonian Graph (G) with no loops and parallel edges. Which of the following is true with respect to this Graph (G)? 1
(a) deg(v) ≥ n/2 for each vertex of G
(b) |E(G)| ≥ 1/2 (n-1)(n-2)+2 edges
(c) deg(v) + deg(w) ≥ n for every v and w not connected by an edge
(A) (a) and (b) (B) (b) and (c)
(C) (a) and (c) (D) (a), (b) and (c)

27 Consider a full-adder with the following input values: 1
(a) x=1, y=0 and C_i(carry input) = 0
(b) x=0, y=1 and C_i = 1
Compute the values of S(sum) and C_0 (carry output) for the above input values.
(A) S=1 , C_0= 0 and S=0 , C_0= 1 (B) S=0 , C_0= 0 and S=1 , C_0= 1
(C) S=1 , C_0= 1 and S=0 , C_0= 0 (D) S=0 , C_0= 1 and S=1 , C_0= 0

28 In XML we can specify the frequency of an element by using the symbols: 1
(A) + * ! (B) # * !
(C) + * ? (D) - * ?

29 In XML, DOCTYPE declaration specifies to include a reference to ..... file. 1
(A) Document Type Definition (B) Document Type Declaration
(C) Document Transfer Definition (D) Document Type language

30 Module design is used to maximize cohesion and minimize coupling. Which of the following is the key to implement this rule? 1
(A) Inheritance (B) Polymorphism
(C) Encapsulation (D) Abstraction

31 RAD stands for ---? 1
(A) Rapid and Design (B) Rapid Aided Development
(C) Rapid application Development (D) Rapid application Design

32 In UNIX, which of the following command is used to set the task priority? 1
(A) init (B) nice (C) kill (D) PS

33 A computer assisted method for the recording and analyzing of existing or hypothetical systems is 1

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(A) Data transmission

(B) Data flow

(C) Data capture

(D) Data processing

34 Which type of system puts the user into direct conversation with the computer through a keyboard? 1

(A) Real time processing

(B) Interactive computer

(C) Batch processing

(D) Time sharing

35 A single packet on a data link is known as 1

(A) Path

(B) Frame

(C) Block

(D) Group

36 A program that is employed in the development, repair or enhancement of other programs is known as 1

(A) System software

(B) Software tool

(C) Applications program

(D) Utility program

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37 Any storage device added to a computer beyond the immediately usable main storage is known as 1

(A) Floppy disk

(B) Hard disk

(C) Backing store

(D) Punched card

38 The tracks on a disk which can be accessed without repositioning the R/W heads is 1

(A) Surface

(B) Cylinder

(C) Cluster

(D) All of the above

39 Which of the following is the 1's complement of 10? 1

(A) 01

(B) 110

(C) 11

(D) 10

40 Which part interprets program instructions and initiate control operations. 1

(A) Input (B) Storage Unit

(C) Logic unit (D) Control Unit

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Section II

- Solve any 3 questions 30

Q 1 Explain trend Analysis and by giving appropriate examples explain temporal mining, valid time in temporal databases, different temporal queries, Temporal association rules, temporal mining, time series data. 10

Solve the following cryptoarithmetic problem

```
  EAT
+
 THAT
-------
 APPLE
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Q 2 State and prove Schema Theorem in the context of Genetic Algorithm. Hand-simulate by taking appropriate set of strings and schema population over the function f(x). 10

Q 3 How partitioning improves performance when finding frequent item sets for large datasets? Explain Data distribution algorithm. 10

Q 4 Discuss the implementation issues and probable solutions of scan line polygon fill algorithm. 10

Q 5 Explain the basic algorithms behind optimized search engines with reference to any popular search engine of your choice. 10

Section III

- Solve any 2 questions 30

Q1 There is middle level company wishing to use the cloud services for handling and storing its sensitive data. Explain in detail various security measures necessary to protect its data. 15

Q2 Suggest and justify different data structures that are necessary for implementing object oriented databases. Explain by taking appropriate example database. 15

Q3 Compare and contrast between: 15

(a) Heuristic Programming and Procedural Programming

(b) Distributed Computing and Parallel Computing.

Q4 Discuss scheduling algorithms in the context of the different operating systems used for automated devices, general purpose computing machines and handheld devices. 15

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