

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: CS352

Course Name: COMPREHENSIVE EXAM (CS)

Max. Marks: 50

Duration: 1 Hour

Instructions

- (1) Each question carries one mark. No negative marks for wrong answers*
- (2) Total number of questions: 50*
- (3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.*
- (4) If more than one option is chosen, it will not be considered for valuation.*
- (5) Calculators are not permitted*

- 1 Let $f(x,y) = x^2 - y^2$. Which of the following is true?
(A) f has a maximum at (0,0)
(B) f has a minimum at (0,0)
(C) (0,0) is neither a maximum point nor a minimum point
(D) None of these
- 2 The differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \frac{dy}{dx} = \sin x$ is of
(A) Order 2, degree 3
(B) Order 3, degree 2
(C) Order 3, degree 3
(D) Order 2, degree 2
- 3 For the equilibrium in three dimensional system of axis, which of the following is true?
(A) $F_x = 0$ (B) $F_y = 0$ (C) $F_z = 0$ (D) All of the above
- 4 The theorem of Pappus and Guldinus is used to find
(A) Surface area of the body of revolution
(B) Surface area of the body of linear motion
(C) Surface area of the body of rectangular motion
(D) None of these
- 5 In isometric projection the angles between the projection of the axes is (in degrees)
(A) 150 (B) 120 (C) 90 (D) 180
- 6 If a point P is below HP and behind VP then in which quadrant does P lie?
(A) First (B) Second (C) Third (D) Fourth
- 7 In which year, Water Act (Prevention and Control of pollution) was introduced in India?
(A) 1975 (B) 1974 (C) 1998 (D) 1988
- 8 Which among the following is a conventional source of energy?
(A) Tidal (B) Solar (C) Coal energy (D) Wind
- 9 The process of building a model of the system to be built is known as
(A) Planning (B) Design (C) Prototyping (D) Estimation
- 10 The technique wherein an object is inspected in detail to identify its components and their interrelationships with the aim of rebuilding or enhancing the object is known as
(A) Reverse Engineering (B) Software Engineering
(C) Inspection (D) Object Analysis

- 11 If $f(x) = 4x + 9$ and $g(x) = x^3$, then determine $(f \circ g)x$. Here 'o' represents composition of functions.
 (A) $(4x+9)^3$ (B) $4x + 9$ (C) $4x^3 + 9$ (D) $64x + 9$
- 12 Consider the two statements below:
 S1 : Every group of prime order is cyclic
 S2 : Every cyclic group is Abelian
 Pick the correct option
- (A) Both S1 and S2 are false (B) Both S1 and S2 are true
 (C) S1 is true but not S2 (D) S2 is true but not S1
- 13 Let 'f' be a function defined from set A to set B. If the cardinalities of domain and range of 'f' are 'm' and 'n' respectively, then which of the following is true?
 (A) $m = n$ (B) $m > n$ (C) $m < n$ (D) $m \leq n$
- 14 A relation R is defined on integers by
 aRb if and only if $|a - b| = 3$.
 What can you say about R?
 (A) R is irreflexive and antisymmetric
 (B) R is symmetric and transitive
 (C) R is antisymmetric and transitive
 (D) R is irreflexive and symmetric
- 15 Which of the following is valid?
 (A) p can be derived from the set of premises $\{(p \rightarrow q), (q \rightarrow r), (\sim q \wedge r)\}$
 (B) $\sim q$ can be derived from the set of premises $\{(p \rightarrow q), \sim p\}$
 (C) $(p \rightarrow (q \wedge r))$ can be derived from the set of premises $\{(p \rightarrow q), (p \rightarrow r)\}$
 (D) q can be derived from the set of premises $\{(p \vee q), p\}$
- 16 The solution to the recurrence $a_n = a_{n-1} + (n - 1)$ with $a_1 = 0$ is
 (A) $\frac{n(n+1)}{2}$
 (B) $\frac{n(n-1)}{2}$
 (C) $\frac{(n+2)(n+1)}{2}$
 (D) $\frac{n(n+3)}{2}$
- 17 Let $f(n)$ and $g(n)$ be two functions such that $f(n) \leq g(n)$ for all values of n. Then
 (A) $f(n) = \Theta(n)$ (B) $f(n) = w(n)$
 (C) $f(n) = O(n)$ (D) $f(n) = \Omega(n)$
- 18 Which of the following suffers from the problem of infinite traversal?
 (A) Singly linked list (B) Doubly linked list
 (C) Circular linked list (D) Linked list with header node
- 19 Assume you have a stack implemented with an array of size SIZE. If the array positions are numbered from 0, the stack underflow can be identified using what condition?
 (A) $TOP = SIZE$ (B) $TOP = -1$
 (C) $TOP = SIZE - 1$ (D) $TOP = 0$
- 20 A complete binary tree is represented using an array. For a node whose position is k, its

- right child can be found at which position? (The array index starts from 1)
(A) $k+1$ (B) $2k$ (C) $2k-1$ (D) $2k+1$
- 21 A binary search tree is constructed out of the keys 5, -1, 12, 30, 15, 2, -87. The inorder traversal of this tree is
(A) 5, -1, 2, 30, 15, 12, -87
(B) 5, 2, -1, 15, 30, 12, -87
(C) -87, -1, 2, 5, 12, 15, 30
(D) -1, 2, 5, 30, 12, 15, -87
- 22 Depth first algorithm can be implemented using
(A) Heap (B) Stack (C) Queue (D) Deque
- 23 The sorting technique in which the smallest element from the unsorted sublist is swapped with the element at the beginning of the unsorted sublist is
(A) Selection sort (B) Insertion sort
(C) Quick sort (D) Bubble sort
- 24 The instruction MOV A,#20 uses which addressing mode?
(A) Register mode (B) Absolute mode
(C) Immediate mode (D) Relative mode
- 25 Which of the following is not an assembler directive?
(A) EQU (B) ORIGIN (C) DATAWORD (D) ADD
- 26 SCSI stands for
(A) Simple computer serial interface (B) Small computer system interface
(C) Serial controller for system interface (D) Simple computer serial interface
- 27 A static RAM cell contains
(A) Transistor (B) Capacitor (C) Inverter (D) Register
- 28 A block-set associative cache memory consists of 128 blocks divided into four block sets. The main memory consists of 16,384 blocks and each block contains 256 eight bit words. How many bits are required for addressing the main memory?
(A) 22 (B) 20 (C) 32 (D) 36
- 29 PLA means
(A) Programmed Large Array (B) Programmable Logic Array
(C) Programmed Long Array (D) Programmable List Array
- 30 Microprogram sequencer is used in
(A) Memory organization (B) Accumulator design
(C) Control unit design (D) None of these
- 31 Consider a system with 'n' processes and 'm' CPUs ($n > m$). What is the maximum number of processes that can be in running state?
(A) 0 (B) 1 (C) n (D) m
- 32 Belady's anomaly occurs in which algorithm?
(A) Optimal algorithm (B) FIFO algorithm
(C) SSTF algorithm (D) Elevator algorithm
- 33 Banker's algorithm is used in
(A) Deadlock prevention (B) Deadlock avoidance
(C) Deadlock detection (D) Deadlock recovery
- 34 A counting semaphore is initialized to 4. Then 8 P(wait) and 3 V(signal) operations are performed on the semaphore. The final value of the semaphore is

- (A)-1 (B)1 (C)2 (D)-2
- 35 A system supports a virtual address space of 4096 pages each with 512 bytes. If the main memory has 1024 frames, the number of bits in physical address is
(A)20 (B)23 (C)21 (D)19
- 36 A computer with 32bit logical addresses uses two level paging. The logical address is divided into a 9 bit top level page table field and an 11 bit second level page table field and an offset field. What is the page size?
(A)4KB (B)2KB (C) 16MB (D)16KB
- 37 Which of the following is also known as elevator algorithm?
(A)SSTF (B) CSCAN (C) SCAN (D)LOOK
- 38 B-tree supports
(A)Direct access of data (B) Sequential access of data
(C) Both (A) and (B) (D)None of these
- 39 Durability property of transactions is enforced by
(A) User (B)Concurrency control subsystem
(C) Recovery subsystem (D) DB administrator
- 40 'n' transactions can be scheduled in how many ways?
(A) N (B) n! (C)n-1 (D)n+1
- 41 Consider the two statements below:
S1 : Every view serializable schedule is also conflict serializable
S2 : Every conflict serializable schedule is also view serializable
Pick the correct option
(A) Both S1 and S2 are false (B) Both S1 and S2 are true
(C) S1 is true but not S2 (D) S2 is true but not S1
- 42 The collection of tuples stored in a database at a particular moment is called
(A)Schema (B) View (C) Instance (D)Relation
- 43 Which of the following is free from deadlocks?
(A) Strict 2PL (2 phase locking) (B) Conservative 2PL
(C) Basic 2PL (D)None of these
- 44 Consider a schedule
 $R_1(A), R_2(B), W_2(B), R_3(A), W_3(A), R_1(B), R_3(B), R_2(A), W_2(A)$
The schedule is
(A)Conflict serializable (B)View serializable
(C)Both (A) and (B) (D)Not serializable
- 45 Which of the following is **not** an application of CFGs?
(A)Well formed parentheses (B)Type checking

(C) If-else matching

(D)String matching

46 Pick the true statement

(A)The language $L = \{a^n \mid n \leq 1000\}$ is regular

(B)DFA is more powerful than NFA

(C)Deterministic PDA is more powerful than non deterministic PDA

(D)Non deterministic TM is powerful than deterministic TM

47 The number of states in the DFA to accept binary strings whose length is divisible by 5

(A)4

(B)5

(C)6

(D)3

48 Context free languages are not closed under

(A)Intersection

(B) Union

(C)Reversal

(D)Kleene closure

49 Which of the strings cannot be generated using the expression $(a^*b)^*a^*$?

(A) aaaaaa (B) abaaa

(C) abab (D)aaaaaba

50 A grammar whose productions are of the form $A \rightarrow BC$ is in what normal form?

(A) Chomsky normal form (B) Greibach normal form

(C) Both (A) and (B)

(D) Neither (A) nor (B)

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SIXTH SEMESTER B.TECH DEGREE COMPREHENSIVE EXAMINATION, MAY 2019

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PART A- COMMON COURSES

- The radius of convergence of the series $\sum_{k=1}^{\infty} \frac{(x-5)^k}{k^2}$ is
 a) 1 b) 2 c) 3 d) 0
- Solution of $y''' - y' = 0$ is
 a) $c_1 + (c_2 + c_3x)e^x$ b) $c_1e^x + c_2e^{-x}$ c) $c_1 + c_2e^x + c_3e^{-x}$ d) $c_1 + (c_2 + c_3x)e^{-x}$
- A mass m is attached to two identical springs having spring constant k . Natural frequency of the single degree of freedom system is
 a) $\sqrt{2k/m}$ b) $\sqrt{3k/m}$ c) $\sqrt{4k/m}$ d) $\sqrt{k/m}$
- A ball of weight 100N is tied to a smooth wall by a cord making an angle of 30 degree to the wall. Tension in the cord is
 a) 86.6 b) 50 c) 75.5 d) 0
- The desired features or characteristics of the design that determine its ultimate effectiveness or suitability for a given task
 a) Design Function b) Design Constraints c) Design analysis d) Design Functions
- In 'House of Quality' the roof represents:
 a) Relationship between customer and manufacturer b) Inter-relationship between technical requirements c) Relation between customer and technical requirements d) Customer requirements
- Lowest atmospheric temperature is observed in -----
 a) Troposphere b) Stratosphere c) Thermosphere d) Mesosphere
- Industrial Symbiosis aims at

- a) zero waste generation b) energy efficiency c) high employment generation d) industrial mechanisation
9. A 5 cm long line is parallel to VP and inclined at 30° to HP. What is its length in the front view?
 a) 4.33 cm b) 2.5 cm c) 5 cm d) 2.88 cm
10. A cylinder is placed on H.P on its base and section plane is inclined to V.P and perpendicular to H.P cutting the solid the section gives
 a) parabola b) circle c) rectangle d) ellipse

PART B- CORE COURSES

11. Which of the following are tautologies?
 1. $p \vee \sim p$ 2. $p \wedge \sim p$ 3. $p \vee (q \vee \sim q)$ 4. $p \vee (q \wedge \sim q)$
 a) 1 and 3 b) 3 and 4 c) 2 and 4 d) 1 and 2
12. $G = \{0, 1, 2, 3, 4, 5\}$ is a group under multiplication modulo 6. Which are the cyclic generators here?
 a) 1, 3, and 5 b) 1 and 5 c) 1, 2, and 3 d) 1, 2, 3, 4, and 5
13. If $A = \{\alpha, \mu\}$ and $B = \{1, 2, 3\}$, what is $n(AXB)$?
 a) 4 b) 6 c) 5 d) 3
14. If every team has to play 19 games in a round robin league, totally how many matches are to be played?
 a) 250 b) 300 c) 200 d) 190
15. Find the complement of 2 in the lattice (S_{60}, D) where D is Divisor
 a) 2 b) 15 c) 6 d) None of these
16. Converse of $P \rightarrow Q$ is
 a) $\neg P \rightarrow \neg Q$ b) $Q \rightarrow P$ c) $\neg Q \rightarrow \neg P$ d) $P \rightarrow Q$
17. Every chain is a _____ lattice
 a) distributive b) complemented c) complete d) bounded
18. Which of the following is not efficiently supported by a singly linked list?
 a) Accessing an element in the current position b) Insertion after current position c) Insertion before current position d) Traversing to the position immediately after the current position
19. The inorder and preorder traversals of a binary tree are [b e f a c d g] and [a e b f d c g] respectively. What is the corresponding preorder traversal?
 a) b f e c g d a b) e d b g f c a c) e d b f g c a d) d e f g b c a
20. Consider the following loop
 for i = 1 to n

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for j = i + 1 to n
  print "Hi"

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The asymptotic time complexity of above loop is

- a) $O(n^3)$ b) $O(n \log n)$ c) $O(n^2)$ d) $O(n)$
21. Time complexity of inserting a new node at the middle of a single linked list is
 a) $O(\log n)$ b) $O(1)$ c) $O(n \log n)$ d) $O(n)$
22. With only enqueue and dequeue operations, how many queues will you need to implement a stack using queue?
 a) 4 (b) 3 c) 2 (d) 1
23. A hash function f defined as $f(\text{key}) = \text{key} \bmod 7$, with linear probing used to resolve collisions. Insert the keys 37,38,72,48,98 and 11 into the table indexed from 0 to 6. What will be the location of 11?
 a) 3 (b) 5 c) 4 (d) 6
24. The following sequence of operations are performed on a stack:
 PUSH(10), PUSH(20), POP, PUSH(10), PUSH(20), POP, POP, POP, PUSH(20), POP
 The sequence of values popped out is:
 a) 20,10,20,10,20 (b) 20,20,10,10,20 c) 10,20,20,10,20 (d) 20,20,10,20,10
25. Consider the given grammar
 $S \rightarrow AB$
 $A \rightarrow BB/a$
 $B \rightarrow AB/b$
 Choose incorrect statement.
 a) aaab can be derived from above grammar. (b) bbab can be derived from above grammar. (c) abba can be derived from above grammar. (d) abbab can be derived from above grammar.
26. Let N be an NFA and w be a string. We say that N accepts w . if
 a) All computation paths of N on w reach an accept state. (b) Exactly one computation path of N on w reaches an accept state. (c) No computation paths of N on w reach an accept state. (d) At least computation paths of N on w reach an accept state.
27. Consider the following language, $L = \{w \in \{0, 1\} \mid w \text{ is a palindrome}\}$, Which of the following grammar generates the above language?
 a) $S \rightarrow 0S0 \mid 1S1 \mid \epsilon$ (b) $S \rightarrow 0S0S \mid 1S1S \mid \epsilon$ c) $S \rightarrow 0S0 \mid 1S1 \mid 0 \mid 1$ (d) $S \rightarrow 0S0 \mid 1S1 \mid 0 \mid 1 \mid \epsilon$

28. A Turing machine that is able to simulate other Turing machines
- a) Nested Turing machines (b) Universal Turing machine (c) Counter machine (d) Multi-tape Turing Machine
29. While applying pumping lemma over a regular language, we consider a string w that belongs to L and fragment it into _____ parts.
- a) 2 (b) 5 (c) 3 (d) 6
30. How many states will be there for the minimum state DFA that accepts strings which ends with 'aa' over the alphabet set {a,b}?
- a) 1 (b) 2 (c) 3 (d) 4
31. Which of the following operators is **not present** in any regular expression?
- a) union (b) concatenation (c) Kleene closure (d) division
32. The page table contains
- a) base address of each page in physical memory (b) page offset (c) page size (d) none of the mentioned
33. Which of the following statements are true?
- I. Shortest remaining time first scheduling may cause starvation
II. Preemptive scheduling may cause starvation
III. Round robin is better than FCFS in terms of response time
- a) I only (b) I and III only (c) II and III only (d) I, II and III
34. If the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O blocks requests are 98, 37, 14, 124, 65, 72
- a) 319 (b) 326 (c) 338 (d) 360
35. A counting semaphore is initialized to 4. Then 8 P(wait) and 3 V (signal) operations are performed on the semaphore. The final value of the semaphore is
- a) 1 (b) -1 (c) 2 (d) -2
36. Simplest way of deadlock recovery is
- a) Roll back (b) Pre-empt resource (c) Lock one of the process (d) Kill the one of the process
37. Suppose that a process is in "Blocked" state waiting for some I/O service. When the service is completed, it goes to the :
- a) Running state (b) Ready state (c) Suspended state (d) Terminated state
38. In fixed size partition, the degree of multiprogramming is bounded by _____
- a) the number of partitions (b) the CPU utilization (c) the memory size (d) all of the mentioned

39. Which of the following register automatically increments its contents during the instruction execution?
- a) Instruction Register(IR) (b) Program Counter(PC) (c) General Purpose register (d) Link Register
40. What is the range of actual exponent in the IEEE single precision standard for floating point numbers?
- a) -126 to 127 (b) -127 to 127 (c) -128 to 128 (d) -126 to 126
41. The method for updating the main memory as soon as a word is removed from the Cache is called
- a) write-through (b) write-back (c) protected write (d) cache-write
42. Instruction decoder of a CPU
- a) Decodes the instruction and carries out the arithmetic and logical operations (b) Decodes the instruction and generates the corresponding control signals. (c) Decodes and stores the instruction currently being decoded. (d) None of the above
43. The number -112 can be represented in sign and magnitude method (8 bit number) as
- a) 00001111 (b) 11110000 (c) 00010000 (d) 01110000
44. A computer uses 32-bit byte addressing. The computer uses a 2-way associative cache with a capacity of 32KB. Each cache block contains 16 bytes. Calculate the number of bits in the TAG, SET, and OFFSET fields of a main memory address.
- a) TAG=18, SET=10, OFFSET=4 (b) TAG=16, SET=12, OFFSET=4 (c) TAG=20, SET=10, OFFSET=2 (d) TAG=16, SET=8, OFFSET=8
45. Consider the join of a relation R with a relation S. If R has m tuples and S has n tuples then the maximum and minimum sizes of the join respectively are
- a) $m + n$ and 0 (b) mn and 0 (c) $m + n$ and $|m - n|$ (d) mn and $m + n$
46. Consider the relation scheme $R = (E, F, G, H, I, J, K, L, M, N)$ and the set of functional dependencies $\{\{E,F\} \rightarrow \{G\}, \{F\} \rightarrow \{I,J\}, \{E,H\} \rightarrow \{K,L\}, \{K\} \rightarrow \{M\}, \{L\} \rightarrow \{N\}\}$ on R. What is the key for R?
- a) $\{E,F\}$ (b) $\{E,F,H\}$ (c) $\{E,F,H,K,L\}$ (d) $\{E\}$
47. If every non-prime attribute is fully functionally dependent on the primary key, then the relation will be in
- a) BCNF (b) 2NF (c) 1NF (d) 3NF
48. Suppose that we have an ordered file with $r = 30,000$ records stored on a disk with block size $B = 1024$ bytes. File records are of fixed size and are unspanned, with record length $R = 100$ bytes. The blocking factor and the number of blocks needed for the file are

- a) 10 and 3000 (b) 3000 and 10 c) 10 and 300 (d) 8 and 3000
49. What does the following query do?
UPDATE student
SET marks = marks*1.10;
- a) It increases the marks of all the students by 10% (b) It decreases the marks of all the students by 90% c) It increases the marks of all the students by 110% (d) It is syntactically wrong
50. Amongst the ACID properties of a transaction, the 'Durability' property requires. that the changes made to the database by a successful transaction persist
- a) Except in case of an operating system crash (b) Except in case of a disk crash c) Except in case of a power failure (d) Always, even if there is a failure of any kind

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PART A- COMMON COURSES

1. The sum of the series $\sum_{n=0}^{\infty} x^n$ is
 - a) $\frac{1}{1-x}$
 - b) $\frac{1}{1+x}$
 - c) $\frac{1}{1-x^2}$
 - d) $\frac{1}{1+x^2}$
2. The solution of the differential equation $\frac{dy}{dx} + y = e^{-2x}$ is
 - a) $y = (A + Bx)e^{2x}$
 - b) $y = (A + Bx)e^{-2x}$
 - c) $y = (A + Bx)e^x$
 - d) $y = (A + Bx)e^{-x}$
3. The resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is
 - a) 120°
 - b) 30°
 - c) 90°
 - d) 60°
4. Two bodies of masses m_1 and m_2 are dropped from the top of a tower of same height. When these bodies reach the ground, their kinetic energies will be in the ratio
 - a) 1 : 2
 - b) 1 : $\sqrt{2}$
 - c) 1 : 4
 - d) 1 : 1
5. The top view of a pentagonal prism with axis perpendicular to the vertical plane and parallel to horizontal plane will be a
 - a) Pentagon
 - b) Rectangle
 - c) Trapezoid
 - d) Straight line
6. In perspective projection the object is assumed to be kept on which of these planes.
 - a) Picture plane
 - b) Horizon plane
 - c) Ground plane
 - d) Central plane
7. Which is the most abundant element available in the atmosphere?
 - a) Oxygen
 - b) Nitrogen
 - c) Argon
 - d) Carbon di oxide
8. The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide
 - a) Carbon Dating
 - b) Carbon Trading
 - c) Carbon Footprint
 - d) Carbon Factor
9. One of the pins in a 3 pin plug top is bigger than the rest. This is most closely related to design for 'X', where 'X' is
 - a) Assembly
 - b) Manufacturing
 - c) Life cycle Cost
 - d) Environment

10. Which of the following can be most appropriately associated with the design space of a ball?
 a) Speed b) Velocity c) Diameter d) Height

PART B- CORE COURSES

11. A six side die is rolled twice. What is the probability that the sum is 9.
 a) $1/6$ b) $1/9$ c) $2/9$ d) $1/8$
12. Which of the propositions are equivalent to $p \Rightarrow q$
 (1) $\sim q \Rightarrow \sim p$ (2) $\sim p \vee q$ (3) $\sim(p \wedge \sim q)$
 a) All b) Only (1), and (2) c) Only (2), and (3) d) Only (1), and (3)
13. Let $X = \{1, 2, \dots, 7\}$ and $R = \{ \langle x, y \rangle \mid x - y \text{ is divisible by } 3 \}$. Then R is an
 a) Equivalence relation b) Reflexive relation c) Symmetric relation d) Transitive relation
14. If 25 teams play in a round robin league, totally how many matches are to be played?
 a) 250 b) 150 c) 350 d) 300
15. The symbolic form of the statement: "If either Santhosh takes calculus or Poonam takes physics then Meenakshi will take English" is
 a) $(S \wedge P) \rightarrow M$ b) $(S \vee P) \rightarrow M$ c) $(S \vee P) \wedge M$ d) $(S \wedge P) \vee M$
16. Contrapositive of $P \rightarrow Q$ is
 a) $\neg P \rightarrow \neg Q$ b) $Q \rightarrow P$ c) $\neg Q \rightarrow \neg P$ d) $P \rightarrow Q$
17. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?
 a) 24400 b) 21300 c) 210 d) 25200
18. A text editor generally allows searching in both directions, with wrap around if necessary. If the sequence of lines of code is stored as a linked list, which type is most suitable?
 a) Singly linked list b) Doubly linked list c) Singly linked circular list d) Doubly linked circular list
19. A circular queue of characters is implemented using a linear array whose first index is 1. The array currently contains the elements d, -, -, a, b, c starting from index 1. Here '-' denotes empty slot. If two elements are deleted and three are added, what are the new positions of rear and front?
 a) 6, 1 b) 4, 6 c) 5, 3 d) 3, 5
20. Consider the following loop
 for $i = 1$ to n
 for $j = 1$ to i
 print "HELLO"
 The asymptotic time complexity of above loop is
 a) $O(n^2)$ b) $O(n \log n)$ c) $O(n^3)$ d) $O(n)$
21. The postfix expression for the infix expression $x \wedge y / (5 * z) + 10$ is

a) $x y^5 z^* / 10 +$ b) $x y 5^* z^* / 10 +$ c) $x y^5 z^* 10 /$ d) $x y 5 z^* / 10 +$
 $+$

22. Which of the following traversal gives nodes in non-decreasing order in a Binary Search Tree
 a) Inorder b) Preorder c) Postorder (d) None of the above
23. The maximum degree of any vertex in a simple graph with n vertices is
 a) $n+1$ b) $n-1$ c) $2n-1$ d) n
24. Given, the hash function $h(k) = k \bmod 3$, what is the number of collisions to store the following sequence of keys? 15, 11, 34, 10, 98, 51, 37, 14, 16, 47
 a) 2 (b) 3 c) 9 (d) 7
25. Regular expression for all strings starts with 'ab' and ends with 'aa' is
 a) $ab(a+b)^*aa^*$ (b) $ab(a+b)^*aa$ c) ab^*aa (d) a^*b^*aa
26. What is the language accepted by the following regular expression, $0^*(1(01^*0)^*1)0^*0^*$?
 a) Binary representation of multiples of 6 (b) Binary representation of multiples of 4
 c) Binary representation of multiples of 3 (d) Binary representation of multiples of 2
27. What is the minimum number of states in a DFA that recognizes the set of all binary strings that contains four consecutive 1's?
 a) 6 (b) 5 c) 4 (d) 3
28. The language accepted by Push down Automaton:
 a) Recursive Language (b) Context free language c) Linearly Bounded language (d) All of the mentioned
29. For a give Moore Machine, Given Input='101010', thus the output would be of length:
 a) $|Input|+1$ (b) $|Input|$ c) $|Input|-1$ (d) Cannot be predicted
30. How many states will be there for the minimum state DFA accepting the language a^*bba .
 a) 2 b) 3 c) 4 d) 5
31. Pigeonhole principle is the underlying principle of
 a) Pumping lemma (b) Turing machine c) Context free grammar (d) Push down automata
32. Which one of the following can not be scheduled by the kernel?
 a) kernel level thread (b) user level thread c) process (d) none of the mentioned
33. A process executes the code
`fork ();`
`fork ();`
`fork ();`
 The total number of child processes created is

$r1 \bowtie r2$ is :

- a) 2000 (b) 2500 c) 4500 (d) 5000

46. Which of the following is NOT a superkey in a relational schema with attributes V, W, X, Y,Z and primary key VY?

- a) VXYZ (b) VWXZ c) VWXY (d) VWXYZ

47. Dependency preservation is not guaranteed in

- a) 3NF (b) BCNF c) 1NF (d) 2NF

48. Suppose that we have an ordered file with $r = 30,000$ records stored on a disk with block size $B = 1024$ bytes. The ordering key field of the file is $V = 9$ bytes long, a block pointer is $P = 6$ bytes long, and we have constructed a primary index for the file. The blocking factor for the index is

- a) 68 (b) 64 c) 10 (d) 3000

49. What is the result of the following query?

DELETE FROM student

WHERE marks < (SELECT avg(marks)

FROM student);

- a) The query deletes all the tuples whose marks are greater than the average marks (b) The query deletes all the tuples whose marks are less than the average marks (c) The query deletes all the values under the marks attribute which are less than the average (d) The query is syntactically wrong and does not execute

50. Ensuring isolation property is the responsibility of the

- a) Recovery-management component of the DBMS (b) Concurrency-control component of the DBMS (c) Transaction-management component of the DBMS (d) Buffer management component in DBMS
