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POLYTECHNIC TRB

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Module Name : Information Technology-E
Exam Date : 08-Dec-2021 Batch : 09:00-12:00

PART-A

1. P ∧ ¬P is a _____.

A) Tautology

B) Disjunction

C) Conditional

D) Contradiction — **(Correct Answer)**

2. A relation R on a set A is called an _____ relation, if R is reflexive, symmetric and transitive.

A) Compatibility

B) Equivalence — **(Correct Answer)**

C) Partial order

D) Associative

3. Surjective function is also called _____.

A) onto — **(Correct Answer)**

B) one-to-one

C) many-to-one

D) into

4. Let f(x) = x^2 + x and g(x) = x + 1. What is the function of fog ?

A) $x^2 + 3x + 2$ — **(Correct Answer)**

B) $x^2 + x + 1$

C) $x^2 + 2x + 1$

D) $x^2 + 2x + 2$

5. If $^nC_{12} = {}^nC_8$, then n equal to _____.

A) 20 — **(Correct Answer)**

B) 12

C) 6

D) 30

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6. A single card is drawn from an ordinary deck of 52 cards. What is the probability that the card is a heart ?

A) 1/4 — **(Correct Answer)**

B) 1/2

C) 3/4

D) 2/3

7. A graph in which every vertex has same degree is called _____ Graph.

A) Complete

B) Simple

C) Regular — **(Correct Answer)**

D) Isolated

8. The rate of convergence of Newton-Raphson method is _____.

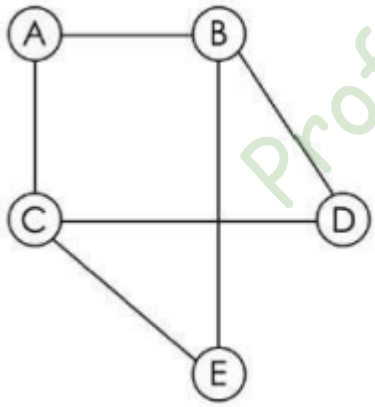
A) Cubic

B) Linear

C) Quadratic — **(Correct Answer)**

D) Zero

9. For the given graph (G), which of the following is true ?



A) G is a complete Graph

B) G is not a connected Graph

C) The vertex connectivity of the graph is 2 — **(Correct Answer)**

D) The edge connectivity of the graph is 1

10. The function $f(x) = 2x^3 - 3x^2 - 36x + 2$ has its maxima at :

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A) x = −2 only — **(Correct Answer)**

B) x = 0 only

C) x = 3 only

D) both x = −2 and x = 3

11. A finite automata is said to be deterministic if :

A) There exists transition for all symbols from all states

B) For each symbol, atmost one transition from any state — **(Correct Answer)**

C) The finite control can be in more than one state at any point of time

D) Recognizes only finite number of strings

12. Choose the correct statement with respect to a finite automata with E-transitions and distinct start and final state ($q_0 \cap F = \Phi$)

A) Strictly no empty string in its language

B) It is always a deterministic finite automata

C) It's language is definitely infinite

D) The finite control can be in more than one state at a time — **(Correct Answer)**

13. The regular expression for the language of the automata M = ($\{q_1, q_2 \ldots . q_n\}, \Sigma, \delta, q_1, F$) is recursively defined as :

A) $R^k_{ij} = R^{k-1}_{ij} \cup R^{k-1}_{ik} R^{k-1}_{kk} R^{k-1}_{kj}$

B) $R^k_{ij} = R^{k-1}_{ij} \cup (R^{k-1}_{ik})^* R^{k-1}_{kk} R^{k-1}_{kj}$

C) $R^k_{ij} = R^{k-1}_{ij} \cup R^{k-1}_{ik} (R^{k-1}_{kk})^* R^{k-1}_{kj}$ — **(Correct Answer)**

D) $R^k_{ij} = R^{k-1}_{ij} \cup R^{k-1}_{ik} R^{k-1}_{kk} (R^{k-1}_{kj})^*$

14. The simplified grammar equivalent to S → AB | a, A → a without any change in language is :

A) S → AB | a

B) S → A | a, A → a

C) S → a, A → a

D) S → a - **(Correct Answer)**

15. A context free language is said to be inherently ambiguous if :

A) Every CFG for the language is ambiguous - **(Correct Answer)**

B) There exists at least one ambiguous grammar

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C) The grammar is ambiguous and the language is infinite

D) The grammar is ambiguous and the language is finite

16. The unambiguous equivalent of the CFG S → iS | iSeS | a is given as :

A) S → M | U

M → iUeU | a

U → iM | iMeU

B) S → M | U

M → iMeM | a

U → iM | iMeU – **(Correct Answer)**

C) S → M | U

M → iMeM | a

U → iUjiUeU

D) S → M | U

M → iMeU a

U → iUjiUeM

17. What is the form of productions in a linear grammar ?

A) A → BC | a

B) A → AB | a

C) A → Aα | b

D) A → aB | a – **(Correct Answer)**

18. The language recognized by a PDA $M = (Q, \Sigma, \Gamma, \delta, q_0, Z_0, F)$

A) { w | (q_0, w, x) ⊢* (p, ε, γ) for some p in F and γ in Γ* }

B) { w | (q_0, w, z_0) ⊢* (p, ε, γ) for some p in F and γ in Γ* } — **(Correct Answer)**

C) { w | (q_0, w, z_0) ⊢* (p, ε, γ) for some p in Q and γ in Γ* }

D) { w | (q_0, w, z_0) ⊢* (p, x, γ) for some p in F and γ in Γ* }

19. Which of the following languages is not context free ?

A) $0^n1^m2^n, n, m \geq 0$

B) $0^n1^m2^m, n, m \geq 0$

C) $0^n1^n2^m, n, m \geq 0$

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D) $0^n1^n2^n, n \geq 0$ – **(Correct Answer)**

20. The language accepted by a Turing Machine $M = (Q, \Sigma, \Gamma, \delta, q_0, B, F)$ is:

A) $\{w|q_\circ w|^*\alpha_1 p\alpha_2, p \text{ in } F\}$ – (Correct Answer)

B) $\{w|q_\circ w|^*\alpha_1 pB, p \text{ in } F\}$

C) $\{w|q_0 w|^* Bp\alpha_2, p \text{ in } F\}$

D) $\{w|q_\circ w|^*$ Bp B, p in F

21. The number 87 in 2's complement representation is :

A) 01010101

B) 11010111

C) 01010111 - **(Correct Answer)**

D) 10101000

22. The decimal equivalent of the excess-3 number 101010011000.01110110 is :

A) 765.43 - **(Correct Answer)**

B) A98.76

C) 764.43

D) A97.76

23. The minimum number of NOR gates required to implement an NAND gate is :

A) 1

B) 2

C) 3

D) 4 - **(Correct Answer)**

24. The number of flip-flops required to realize mod-21 counter is :

A) 4

B) 5 - **(Correct Answer)**

C) 7

D) 9

25. A multiplexer is also known as :

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A) Data Selector - **(Correct Answer)**

B) Data Encoder

C) Data Decoder

D) Data Distributer

26. The minimum number of 2-input NAND gates required to implement the full adder is :

A) 6

B) 8

C) 9 - **(Correct Answer)**

D) 10

27. Which of the following expression is not equivalent to x' ?

A) x NAND x

B) x NOR X

C) x NAND 1

D) X NOR 1 - **(Correct Answer)**

28. If $(1011)_3 = (111)_X$ then what is the value of x ?

A) 2

B) 3

C) 4

D) 5 - **(Correct Answer)**

29. The output of a three input logic gate is 1 when its inputs are 1,1 and 0 . Then logic gate is :

A) NAND - **(Correct Answer)**

B) NOR

C) AND

D) EX-OR

30. The minimum number of J-K flip-flop needed to design a mod-514 counter is :

A) 512

B) 514

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C) 9

D) 10 - **(Correct Answer)**

31. For addressing IM words in memory a total of ___ pins are needed.

A) 16

B) 20 - **(Correct Answer)**

C) 18

D) 15

32.The daisy chain procedure is :

A) hardware poll

B) Interrupt acknowledgement is chained

C) Vector interrupt routine

D) all hardware poll, Interrupt acknowledgement is chained and Vector interrupt routine - **(Correct Answer)**

33. Represent - 18 is signed magnitude 8 bits representation :

A) 00010010

B) 10010010 - **(Correct Answer)**

C) 00011001

D) 10011001

34. Write three address instructions by Execute $Y = \frac{A-B}{C+(D\times E)}$

A) SUB Y, A, B MPY T, D, E DIV Y, Y, T ADD T, T, C

B) ADD T, T, C DIV Y, Y, T MPY T, D, E SUB Y, A, B

C) SUB Y, A, B ADD T, T, C MPY T, D, E DIV Y, Y, T

D) SUB Y, A, B MPY T, D, E ADD T, T, C DIV Y, Y, T - **(Correct Answer)**

35. True dependency data hazard means :

A) An instruction modifies a register or memory location and a succeeding instruction reads the data in that memory or register location - **(Correct Answer)**

B) An instruction reads a register or memory location and a succeeding instruction writes to the location

C) Two instructions both write to the same location

D) Anti-dependency

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36. Output dependency data hazard means :

A) An instruction modifies a register or memory location and a succeeding instruction reads the data in that memory or register location

B) An instruction reads a register or memory location and a succeeding instruction writes to the location

C) Two instructions both write to the same location - **(Correct Answer)**

D) None of these

37. You have a system that contains a special processor for doing floating point operations. You have determined that 50% of your computations can use the floating point processor. The speed up of the floating point processor is 15 . Overall speed up achieved by using the floating point processor is :

A) 0.876

B) 1.876 - **(Correct Answer)**

C) 6.876

D) 7.0

38. A non pipelined processor has a clock rate of 2.5 GHz and an average CPI of 4. An upgrade to the processor introduces a five

stage pipeline. However due to internal pipeline delays such as latch delay, the clock rate has reduced to 2 GHz. What is the MIPS rate for each processor ?

A) 625 MIPS 2000 MIPS - **(Correct Answer)**

B) 625 MIPS 1000 MIPS

C) 625 MIPS 2500 MIPS

D) 2.5 MIPS 2000 MIPS

39. Identify the read-write dependences in the following instruction sequence :

L1 : R1 = 100

L2 : R1 = R2 + R4

L3 : R2 = R4-25

L4 : R4 = R1 + R3

L5 : R1 = R1+30

A) L2-L4, L2-L5, L2-L4

B) L1-L4, L1-L5, L1-L2

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C) L2-L3, L2-L4, L3-L4, L4-L5 - **(Correct Answer)**

D) L2-L5, L1-L4, L1-L5, L2-L3

40. Which of the following affects the processing power of the CPU ?

A) Data bus, addressing schemes

B) Clock speed, addressing schemes

C) Clock speed, data bus

D) Clock speed, data bus, addressing schemes - **(Correct Answer)**

41. Which of the following is non-linear data structure ?

A) Stacks

B) Lists

C) Array

D) Trees - **(Correct Answer)**

42. Pushing an element into stack already having five elements and stack size of five, then stack becomes ___ .

A) Overflow — **(Correct Answer)**

B) Underflow

C) Empty

D) Crash

43. What is the value of the postfix expression

6, 3, 2, 4, +, -, *?

A) Something between −15 and −100 — **(Correct Answer)**

B) Something between 5 and 15

C) Something between −5 and −15

D) Something between 15 and 100

44. The node that has no children is referred as ___ .

A) Parent node

B) Leaf node - **(Correct Answer)**

C) Root node

D) Siblings

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45. The complexity of linear search algorithm is ___ .

A) O(n) - **(Correct Answer)**

B) O(log n)

C) $O(n^2)$

D) O(n log n)

46. Visiting the root node last is called ___ .

A) Inorder traversal

B) Preorder traversal

C) Post order traversal - **(Correct Answer)**

D) Both Inorder traversal and Preorder traversal

47. A ___ refers to a set of data values and associated operations that are specified accurately, independent of any particular implementation.

A) Algorithm

B) Unstructured data

C) Abstract Data Type - **(Correct Answer)**

D) Arranged data set

48. The ___ function is used to get formatted input from the user in C language.

A) gets()

B) getc()

C) getch()

D) scanf() - **(Correct Answer)**

49. What is the value of 10 % 8 ?

A) 2 - **(Correct Answer)**

B) 1

C) 3

D) 4

50. What is the result of the expression ? (10/3) * 3 + 5 % 3

A) 11 - **(Correct Answer)**

B) 10

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C) 8

D) 1

51. Determining the order of magnitude of the frequency of execution of statements in an algorithm analysis is called as ___ .

A) Symbolic Notation

B) Time complexity

C) Algorithm Analysis

D) Asymptotic Notation - **(Correct Answer)**

52. If the problem is large, it is divided into sub-problems. What is the name of the technique ?

A) Branch and Bound technique

B) Greedy Method

C) Divide and Conquer strategy - **(Correct Answer)**

D) Dynamic programming

53. The element which is used to split up an array into two subsets is called ___ .

A) Splitting element

B) Pivot element

C) Partition element

D) Splitting element, Pivot element and Partition element - **(Correct Answer)**

54. Algorithm Designing strategies are represented using ___ .

A) SPARKS

B) Control Abstraction - **(Correct Answer)**

C) Algorithm

D) PASCAL

55. What is Knapsack problem ?

A) The problem of sorting 'n' elements in a knapsack of capacity

B) The problem of splitting up of knapsack into 'n' elements

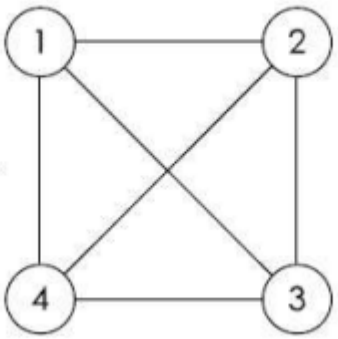
C) The problem of maximizing the dumping of objects into knapsack with profitability. - **(Correct Answer)**

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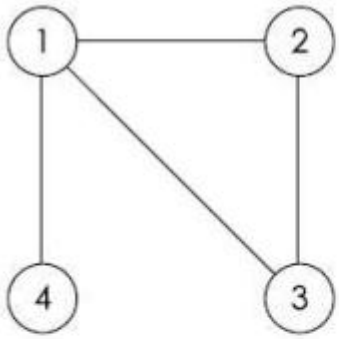
D) The problem of finding the minimum and maximum no. of objects in a Knapsack

56. Which of the following are not a spanning tree for the graph given below :

G(V, E) =

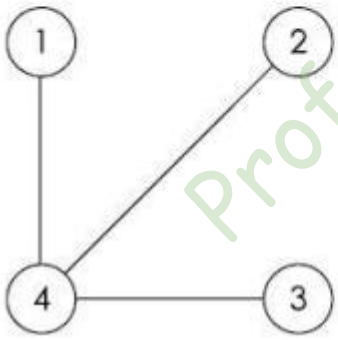


A :



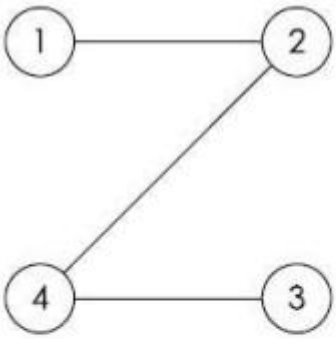
– (Correct Alternative)

B :

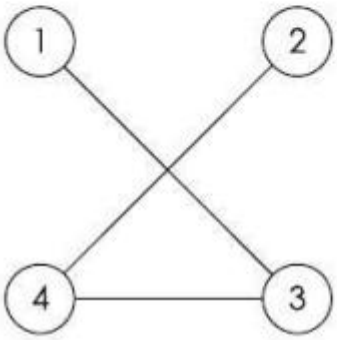


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C :



D :



57. Assume ' n ' programs of lengths $1_1, 1_2 \ldots . 1_n$ are to be stored on a tape. Program i is to be retrieved with frequency f_i. If the programs are stored in the order $i_1, i_2, i_3 \ldots \ldots i_n$, the expected retrieval time (ERT) is ___ .

A) $[\sum_j (f_{ij} \sum_{k=1}^{j} l_{ik})] * \sum f_i$

B) $[\sum_j (f_{ij} \sum_{k=1}^{j} l_{ik})] / \sum$ –(Correct Answer) fi

C) $[\sum_j (f_{ij} \sum_{k=1}^{j} n^* l_{ik}) / \sum f_i]$

D) $[\sum_j (f_{ij} \sum_{k=1}^{j} l_{ik}) * n * \sum f_i]$

58. ___ is used to represent a graph in single source shortest path problem.

A) Cost Matrix

B) Adjacency Matrix - **(Correct Answer)**

C) Path Matrix

D) Weight Matrix

59. What is the maximum time and space taken by Breadth first search algorithm on any Graph G with n vertices and e edges ? When we used adjacency list.

A) $t(n, e) = O(n + e)$ and $s(n, e) = O(n)$ – **(Correct Answer)**

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B) $t(n, e) = \Omega(n + e)$ and $s(n, e) = \Omega(n)$

C) $t(n, e) = Q(n + e)$ and $s(n, e) = Q(n)$

D) $t(n, e) = Q(n - e)$ and $s\ (n, e) = Q(n)$

60. In back tracking, all paths from root to other nodes defines ___ .

A) Answer state

B) Solution space

C) State space - **(Correct Answer)**

D) Solution state

61. Which one of the following is a synchronization tool ?

A) Thread

B) Pipe

C) Socket

D) Semaphore - **(Correct Answer)**

62. The logical extension of multiprogramming operating system is ___ .

A) Time sharing

B) Multi-tasking

C) Simple Programming

D) Both Time sharing and Multi-tasking - **(Correct Answer)**

63. In a pure kernel level thread all the work of thread management is done by the :

A) Application

B) Program

C) Kernel - **(Correct Answer)**

D) Threads

64. For web based computing system, computer used are normally :

A) Personal computers

B) Tablets

C) Network computers - **(Correct Answer)**

D) Servers

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65. The address generated by CPU is called :

A) Physical address

B) Absolute address

C) Logical address - **(Correct Answer)**

D) Module address

66. A process is :

A) program in high level language kept on disk

B) contents of main memory

C) a program in execution - **(Correct Answer)**

D) a Job in secondary memory

67. Because of virtual memory, the memory can be shared among :

A) Process - **(Correct Answer)**

B) Threads

C) Instructions

D) Time

68. Effective access time is directly proportional to :

A) Page fault rate - **(Correct Answer)**

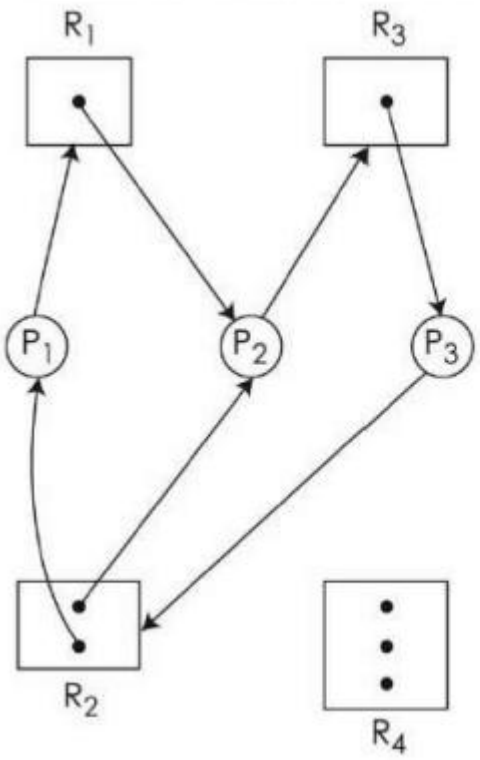
B) Hit ratio

C) Memory access time

D) Design

69. In the given, Resource-Allocation graph, identify the minimum number of cycles.

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A) 2 - **(Correct Answer)**

B) 3

C) 1

D) 0

70. Consistency semantics evaluates :

A) file removal

B) file sharing - **(Correct Answer)**

C) file modification

D) file missing

71. An attribute type consisting of first name, middle name and last name is called as ___ .

A) Simple attribute

B) composite attribute - **(Correct Answer)**

C) Multivalued attribute

D) Derived attribute

72. In the domain calculus "there exist" can be expressed as :

A) $(p_1(x))$

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B) $(p_1(x))$ ϑ x

C) $Vxp_1(x)$

D) ə x ($p_1(x)$) - **(Correct Answer)**

73. ___ is the bottom-up approach to database design that design by examining the relationship between attributes.

is the bottom-up approach to database design that design by examining the relationship between attributes.

A) Functional dependency

B) Database modelling

C) Normalization - **(Correct Answer)**

D) Decomposition

74. An ___ can be an arbitrary predicate applied to the database.

A) Data Integrity

B) Integrity constraints - **(Correct Answer)**

C) Referential Integrity

D) Unique constraints

75. In a ___ based clustering index, the index record contains the search-key value and a pointer to the first data record with that search-key value and the rest of the records will be in the sequential pointers.

A) Dense - **(Correct Answer)**

B) Sparse

C) Straight

D) Continuous

76. The property of a DBMS transaction that persist all the crashes is :

A) Atomicity

B) Durability - **(Correct Answer)**

C) Isolation

D) All of the mentioned

77. The ___ trees are particularly useful as a database system index and n-array tree.

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A) B tree

B) B + tree - **(Correct Answer)**

C) Binary search tree

D) 2-3 tree

78. Which of the following is true ?

A) Every relation in 3NF is also in BCNF

B) A relation R is in 3NF if every non-prime attributes of R is fully functionally dependent on every key of R

C) Every relation in BCNF is also 3NF - **(Correct Answer)**

D) No relation can be in both BCNF and 3NF

79. Consider the following relational schemes for a library database :

Book (Title, Author, Catalog_no, Publisher, Year, Price)

Collection (Title, Author, Catalog_no)

With the functional dependencies:

I : Title Author → catalog_no

II : catalog_no → Title Author publisher year

III : Publisher Title year → Price

Assume {Author, Title} is the key for both schemes. Which of the following statement is true?

A) Both Book and collection are in BCNF

B) Both Book and collection are in 3NF only

C) Book is in 2NF and collection is in 3NF - **(Correct Answer)**

D) Both Book and collections are 2NF only

80. 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 requires less memory than binary search trees

D) Data transfer from disks in blocks - **(Correct Answer)**

81. Which of the following is not a desirable characteristic of SRS document ?

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A) Concise

B) Ambiguous - **(Correct Answer)**

C) Traceable

D) Verifiable

82. A CoCoMo is :

A) Common Cost Model

B) Constructive Cost Model - **(Correct Answer)**

C) Complete Cost Model

D) Comprehensive Cost Model

83. Importance of S/W design can be summarized in a single word. Which is ?

A) Efficiency

B) Accuracy

C) Quality - **(Correct Answer)**

D) Complexity

84. The database design deals with the design of :

A) Logical database

B) Physical database

C) Both Logical database and Physical database - **(Correct Answer)**

D) Only Logical database

85. _____ language applies typed set, relations and functions within the context of first order predicate logic to build schemas.

A) Z - **(Correct Answer)**

B) X

C) R

D) P

86. OCL is ___ .

A) Object Concept Language

B) Object Constraint Language - **(Correct Answer)**

C) Object Class Language

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D) Object Configuration Language

87. One of the following attributes is not matching for a good test case :

A) It has the high probability of finding error

B) It is not redundant

C) It should be "best of breed"

D) It should be simple and easy - **(Correct Answer)**

88. Beta testing is done at :

A) User's site - **(Correct Answer)**

B) Developer's site

C) Both User's site and Developer's site

D) Independent tester

89. What is the cyclomatic complexity of a code consisting of 4 if-then-else statements?

A) 4

B) 5 - **(Correct Answer)**

C) 3

D) 6

90. The modification of the software to match changes in the even changing environment, falls under which category of maintenance?

A) Corrective

B) Adaptive - **(Correct Answer)**

C) Perfective

D) Preventive

91. The ___ between two words is the number of differences between corresponding bits.

A) Hamming rule

B) Hamming code

C) Hamming distance - **(Correct Answer)**

D) Hamming law

92. A ___ error means that two or more bits in the data unit have changed.

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A) Burst - **(Correct Answer)**

B) Double-bit

C) Single-bit

D) Large-bit

93. In ___ delivery, the deliverer of the IP packet and the destination are on different networks.

A) a connection oriented

B) a direct

C) an indirect - **(Correct Answer)**

D) web based

94. CBT is a ___ protocol that uses a core as the root of the tree.

A) Source based

B) Group shared - **(Correct Answer)**

C) Level based

D) Knowledge based

95. In multicast routing, each involved router needs to construct a ___ path tree for each group.

A) Average

B) Longest

C) Shortest - **(Correct Answer)**

D) Bigger

96. Urgent data requires the urgent pointer field as well as the URG bit in the ___ field.

A) Control - **(Correct Answer)**

B) Offset

C) Sequence number

D) Application level

97. UDP needs the ___ address to deliver the user datagram to the correct application process.

A) Port - **(Correct Answer)**

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B) Application

C) Internet

D) Telelink

98. Each station on an ethernet network has a unique ___ address imprinted on its Network Interface Card (NIC).

A) 48 - bit - **(Correct Answer)**

B) 32 - bit

C) 5 - byte

D) 2 - byte

99. _____ is the most widely used local area network protocol.

A) Token bus

B) Ethernet - **(Correct Answer)**

C) Token ring

D) Ring bus

100. ___ happens in any system that involves waiting.

A) Congestion - **(Correct Answer)**

B) Jamming

C) Error

D) Options

101. What will be ratio compounded of the 3 ratios

2 : 3, 6 : 11 and 11 : 2 ?

A) 2 : 1 - **(Correct Answer)**

B) 2 : 3

C) 1 : 2

D) 3 : 2

102. Who is called as 'the Master of the Seven notes of Music' ?

A) Pandiya Nedunchezhiyan

B) Cheran Senguttuvan

C) Karikalan - **(Correct Answer)**

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D) Mahendiran I

103. Impulse is expressed ___ .

A) Force x Time - **(Correct Answer)**

B) Mass x Acceleration

C) Momentum/Time

D) Mass x Velocity

104. Which one of the following is a Vat dye ?

A) Alizarin

B) Bismarck brown

C) Indigo - **(Correct Answer)**

D) Malachite green

105. A concentric arrangement of bundle sheath cells of the leaves of C-4 plants is called ___ .

A) anamalous thickening

B) kranz anatomy - **(Correct Answer)**

C) cystolith

D) quantosome

106. Who organised green turbaned peasants agitation in 1972 ?

A) E.V.R. Periyar

B) Narayanaswami - **(Correct Answer)**

C) Nallakannu

D) K. Kamaraj

107. Who was the First Nayak Ruler of Madurai ?

A) Krishnappa Nayak

B) Visvanatha Nayak - **(Correct Answer)**

C) Tirumalai Nayak

D) Chokkanatha Nayak

108. Annie Besant established the Home Rule League at :

A) Bombay

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B) Calcutta

C) Madras - **(Correct Answer)**

D) Lucknow

109. 'Fathom' is a unit to measure the :

A) Salinity

B) Volcanic activity

C) Mass movement

D) Sea water depth - **(Correct Answer)**

110. In which Tamil literature, the word 'Sangam' is used?

A) Agathiyam

B) Tholkappiyam - **(Correct Answer)**

C) Thirukural

D) Iraiyanar Ahapporul Urai

PART-B

1. If A, B, C are three events such that $P(B) = 3/4, P(A \cap B \cap \overline{C}) = 1/3$, and $P(\overline{A} \cap B \cap \overline{C}) = 1/3$ then $P(B \cap C)$ equals :

A) 1/12 - **(Correct Answer)**

B) 1/6

C) 1/15

D) 1/9

2. If $a_{m'n}$ is defined recursively for $(m, n) \in \mathbb{N} \times \mathbb{N}$ by $a_{0,0} = 0$, $a_{m,n} =$

$$\begin{cases} a_{m-1,n} + 1 & \text{if } n = 0, m > 0 \\ a_{m,n-1} + n & \text{if } n > 0 \end{cases}$$

then for any $(m, n) \in \mathbb{N} \times \mathbb{N}$, $a_{m'}n$ is given by :

A) $\frac{m(m+1)}{2} + \frac{n(n+1)}{2}$

B) $\frac{n^2+n+2\,m}{2} -$ **(Correct Answer)**

C) $\frac{2m+n-1}{2}$

D) None of these

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3. Solution of $e^x - 3x = 0$ correct to two decimal places is :

A) 1.53

B) 1.51 - **(Correct Answer)**

C) 1.50

D) 1.54

4. The function $f(t) = \int_{-1}^{x} t(e^t - 1)(t-1)(t-2)^3(t-3)^5\, dt$ has a local minima at $t =$

A) 0 and 1

B) 1 and 3 - **(Correct Answer)**

C) 2 and 3

D) 1, 2 and 3

5. Which of the following grammar rules violate the requirements of being in Chomsky Normal Form ? P, Q and R are non-terminals and r, s and t are terminals.

$P \rightarrow QR$

$P \rightarrow QsR$

$P \rightarrow \varepsilon$

$P \rightarrow \dagger$

A) (i) and (ii) only

B) (i) and (iii) only

C) (ii) and (iii) only - **(Correct Answer)**

D) (iii) and (iv) only

6. If $G = \{\{S\}, \{a\}, \{S \rightarrow SS\}, S\}$, then language generated by G is :

A) $L(G) = \Phi -$ **(Correct Answer)**

B) $L(G) = a^n$

C) $L(G) = a^*$

D) $L(G) = a^o$

7. Find the minimum number of states required in Non-deterministic Finite Automata for the given regular expression :

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RE $= (\mathbf{a}+\mathbf{b})^{*}\mathbf{aba}(\mathbf{a}+\mathbf{b})^{*}\mathbf{aba}(\mathbf{a}+\mathbf{b})^{*}$

A) 6

B) 7 - **(Correct Answer)**

C) 5

D) 8

8. Which of the following statements is true ?

A) If a language is context free it can always be accepted by a deterministic pushdown automaton

B) The union of two context free languages is context free - **(Correct Answer)**

C) The intersection of two context free languages is context free

D) The complement of a context free language is context free

9. The output of a logic gate is 1 when all its inputs are at logic 0 . The gate is either :

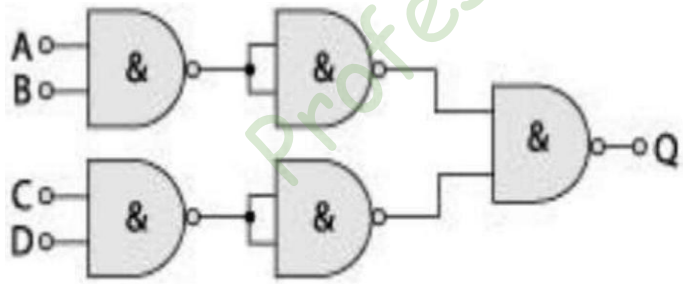
A) a NAND or an EX-OR

B) an OR or an EX-NOR

C) an AND or an EX-OR

D) a NOR or an EX-NOR - **(Correct Answer)**

10. What will be the output *Q* for the given circuit implementation ?



A) Q = (A.B.C.D)' - **(Correct Answer)**

B) Q = (A.B.C.D)

C) $Q = 0'$

D) Q = 1

11. Consider the function, $F = \Sigma(0, 1, 5, 7, 15, 14, 10)$. Find the number of prime implicants present in it.

A) 5

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B) 6 - **(Correct Answer)**

C) 4

D) 7

12. On the third clock pulse, a 4-bit Johnson sequence is $Q_0 = 1, Q_1 = 1, Q_2 = 1$, and $Q_3 = 0$. On the fourth clock pulse, the sequence is ___ .

A) $Q_0 = 1, Q_1 = 0, Q_2 = 0, Q_3 = 0$

B) $Q_0 = 1, Q_1 = 1, Q_2 = 1, Q_3 = 0$

C) $Q_0 = 0, Q_1 = 0, Q_2 = 1, Q_3 = 1$

D) $Q_0 = 0, Q_1 = 0, Q_2 = 0, Q_3 = 1$

Correct Answer:- *

13. Consider a machine with clock rate of 200 MHz . The following measurements were recorded while running a given set of benchmark programme

INS Type	Count	Cycles Per Instruction
Arithmetic and Logic	10	1
Load and store	8	2
Branch	2	4
Others	4	3

Calculate the MIPS rate :

Calculate the MIPS rate :

A) 90

B) 104 - **(Correct Answer)**

C) 108

D) 94

14. Assume the following performance characteristics on a cache. Read miss : One clock cycle to send an address to main memory and four clock cycles to access a 32 bit word from main memory and transfer it to the processor and cache. What is the miss penalty if the cache line size is a transfer is executed with one clock cycle per word transfer ?

A) 5 clock cycles

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B) 20 clock cycles

C) 8 clock cycles

D) 4 clock cycles

Correct Answer:- *

15. Consider a disk that rotates at 3600 rpm . The seek time to move the head between the adjacent track is 2 ms. There are 32 sectors per track, which are stored in linear order from sector 0 to sector 31. The head sees the sector in ascending order. Assume the read/write head is positioned at the start of sector 1 on track 8. There is a main memory buffer large enough to hold an entire track. How long will it take to transfer sector 1 on track 8 to sector 1 on track 9 ?

A) 17.24 ms

B) 16.2 ms

C) 16.7 ms

D) 17.28 ms

Correct Answer:- *

16. A system is based on an 8 bit microprocessor and has two I/O devices. The I/O controllers for this system use separate Control and Status registers. Both devices handle data on a 1 byte at a time basis. The first device has two status lines and three control lines. The second device has three status lines and four control lines. How many distinct addresses are needed to control the two devices?

A) Six

B) Eight

C) Seven - **(Correct Answer)**

D) Nine

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

A) + + * + 234 * * 5 + 6789 - **(Correct Answer)**

B) + * + + 234 * * 5 + 6789

C) * + + 234 * * 5 + + 6789

D) $* + + + 234 ** 5 + 6789$

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18. Consider a max heap represented by the array : 40 , 30, 20, 10, 15, 16, 17, 8, 4

index

index	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
value	40	30	20	10	15	16	17	8	4

Now consider that a value 35 is inserted into this heap. After insertion, the new heap is :

A) 40, 30, 20, 10, 15, 16, 17, 8, 4, 35

B) 40, 35, 20, 10, 30, 16, 17, 8, 4, 15 - **(Correct Answer)**

C) 40, 30, 20, 10, 35, 16, 17,8,4, 15

D) 40, 35, 20, 10, 15, 16, 17, 8, 4, 30

19. The following postfix expressions with single digit operands is evaluates using a stack. 823^/23* + 51* − Note that ^ is the exponentiation operator. The top two elements of the stack after the first * is evaluated are :

A) 6, 1 - **(Correct Answer)**

B) 5, 7

C) 3, 2

D) 1, 5

20. The following C function takes a singly linked list as input argument. It modifies the list by moving the last element to the front of the list and returns the modified list. Some part of the code is left blank.

```
typedef struct nodel {
    int value;
    struct node1 * next;
    } Node;


Node * move_to_front (Node * head) {
Node *p, *q;
if(head == NULL !! head -> next == NULL)
return head;
q = NULL; p = head;
while(p -> next !=NULL) {
q = p;
p = p -> next;
```

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}
return head;
}
Choose the correct alternative to replace the blank line.

A) q = NULL; p -> next = head; head = p;

B) q -> next = NULL; head = p; p -> next = head;

C) head = p; p -> next = q; q -> next = NULL;

D) p -> next = NULL; next = head; head = p; - **(Correct Answer)**

21. If $T(1) = O(1)$, give the correct matching for the following pairs :

(a) $T(n) = T(n-1) + n$ (i) $T(n) = O(n)$

(b) $T(n) = T(n/2) + n$ (ii)$T(n) = O(n \log n)$

(c) $T(n) = T(n/2) + \log n$ (iii) $T(n) = O(n^2)$

(d) $T(n) = T(n-1) + \log n$ (iv) $Tn = O(\log^2 n)$

A) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

B) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii) — **(Correct Answer)**

C) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

D) (a)-(iii), (b)-(i), (c)-(iii), (d)-(iv)

22. We wish to show that problem B is NP-complete. Which of the following facts is sufficient to establish this ?

A) There is a polynomial time reduction from B to SAT

B) There is a polynomial time reduction from SAT to B

C) There is a polynomial time reduction from SAT to B and B has a polynomial time checking algorithm - **(Correct Answer)**

D) There is a polynomial time reduction from B to SAT and B has a polynomial time checking algorithm

23. An array A contains N integers arranged in a random sequence. We want to check if any value is duplicated in the sequence. Which of the following would be the most efficient algorithm, asymptotically, in the worst case ?

A) For each pair of positions i and j, check if A[i] is equal to A[j]

B) Sort the array using insertion sort. When inserting each element into the sorted prefix, check if there is already a value equal to it in the prefix

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C) Sort the array using merge sort. Scan the sorted array from beginning to end looking for adjacent equal elements **(Correct Answer)**

D) Sort the array using quick sort. Use binary search on the sorted array to find duplicated values

24. How many different ways of inserting the keys $\{23, 33, 34, 42, 46, 52\}$ are there using the hash function $h(k) = k \bmod 10$ and linear probing that will result in the same hash table as shown below ?

Index	Value
0	
1	
2	42
3	23
4	34
5	52
6	46
7	33
8	
9	

A) 10

B) 20

C) 30 - **(Correct Answer)**

D) 40

25. The data-in register of I/O port is :

A) read by the host to get input - **(Correct Answer)**

B) read by the controller to get input

C) written by the host to send output

D) written by the host to start a command

26.The protection domain of a process contains :

A) Object name

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B) Rights - set

C) Both Object name and Right-set - **(Correct Answer)**

D) Job name

27. Bounded capacity and unbounded capacity queues are referred to as :

A) Programmed buffering

B) Automatic buffering - **(Correct Answer)**

C) User defined buffering

D) No buffering

28. The address of a page table in memory is pointed by :

A) stack pointer

B) page table base register - **(Correct Answer)**

C) page register

D) program counter

29. The following set of functional dependencies are given in a schema with attributes A, B, C, D & E.

A → B

A → C

CD → E

B → D

E → A Which of the following functional dependencies is NOTimplied by the above set?

A) BC → CD

B) $CD \rightarrow AC$ - **(Correct Answer)**

C) BD → CD

D) AC → BC

30. Relation R is decomposed using a set of functional dependencies, F and relation S is decomposed using another set of functional dependencies G. One decomposition is definitely BCNF, the other is definitely 3NF, but it is not known which is which. To make a guaranteed identification, which one of the following tests should be used on the decompositions ? (Assume that the closures of F and G are available).

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A) Dependency - preservation

B) Lossless-Join

C) BCNF definition - **(Correct Answer)**

D) 3NF definition

31. In the Relation Schema R the prime attribute appears :

A) in some candidate key of R.

B) in a foreign key of R.

C) in all candidate keys of R.

D) only in the primary key of R. - **(Correct Answer)**

32. Consider the following relations A, B and C.

Id	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

Id	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

Id	Phone	Age
10	2200	02
99	2100	01

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How many tuples does the result of the following SQL query contain ?
Select A. Id
From A
Where A. Age > All (select B. Age from B
Where B. Name = 'Arun')
A) 4 - **(Correct Answer)**
B) 3
C) 0

D) 1

33. Requirement prioritization and negotiation belongs to :

A) Requirement validation

B) Requirement elicitation - **(Correct Answer)**

C) Feasibility study

D) Requirement Reviews

34. Match the following :

(A) Code and Fix

(B) Evolutionary Prototyping

(C) Spiral

(D) Staged delivery

(E) Waterfall

(i) Assess risks at each step; do most critical action first

(ii) Build an initial small requirement specification code it; then evolve the specification of code as needed

(iii) Build initial requirement specification for reversal releases then design and code in sequence

(iv) Standard phases in order

(v) Write same code, debug it, repeat

A) (A) - (ii), (B) - (iii), (C) - (iv), (D) - (v), (E) - (i)

B) (A) - (iii), (B) - (iv), (C) - (v), (D) - (i), (E) - (ii)

C) (A) - (iv), (B) - (iii), (C) - (ii), (D) - (v), (E) - (i)

D) (A) - (v), (B) - (ii), (C) - (i), (D) - (iii), (E) - (iv) - **(Correct Answer)**

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35. In function point analysis, the number of complexity adjustment factors is :

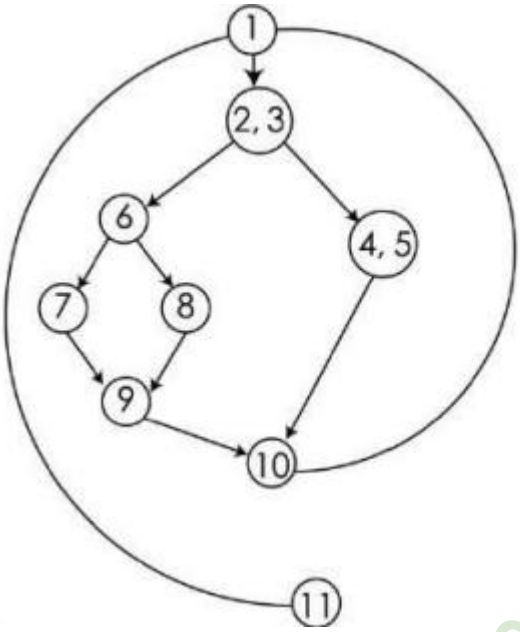
A) 10

B) 12

C) 13

D) 14 - **(Correct Answer)**

36. Program flow graph of a code is given below :



What is cyclomatic complexity constant ?

A) 4 — **(Correct Answer)**

B) 5

C) 6

D) 3

37. Which of the following is an application layer service ?

A) File transfer and access

B) Mail service

C) Remote log-in

D) File transfer and access, Mail service and Remote log-in - **(Correct Answer)**

38. In IPv4, What is the length of the data field given an HLEN value of 10 and total length value of 40,000 ?

A) 39,988

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B) 40,012

C) 40.048

D) 39,952

Correct Answer:- *

39. SMTP is a ___ protocol.

A) PULL

B) PUSH - **(Correct Answer)**

C) PULL and PUSH

D) Good and return

40. TCP allows the sending process to deliver data as a ___ of bytes and allows the receiving process to obtain data as a of bytes.

A) Message ; message

B) Stream ; stream - **(Correct Answer)**

C) Block : block

D) Level ; tocken

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