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PAPER – III

COMPUTER SCIENCE & APPLICATIONS 100071

Signature of the Invigilator Question Booklet No. .....

1. OMR Sheet No.. .....

Subject Code 10 **ROLL No.**

Time Allowed : 150 Minutes **Max. Marks : 150**

No. of pages in this Booklet : **12** No. of Questions : **75**

INSTRUCTIONS FOR CANDIDATES

1. Write your Roll No. and the OMR Sheet No. in the spaces provided on top of this page.
2. Fill in the necessary information in the spaces provided on the OMR response sheet.
3. This booklet consists of seventy five (75) compulsory questions each carrying 2 marks.
4. Examine the question booklet carefully and tally the number of pages/questions in the booklet with the information printed above. **Do not accept a damaged or open booklet**. Damaged or faulty booklet may be got replaced within the first **5** minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time given.
5. Each Question has four alternative responses marked (A), (B), (C) and (D) in the OMR sheet. You have to completely darken the circle indicating the most appropriate response against each item as in the illustration.



6. All entries in the OMR response sheet are to be recorded in the original copy only.
7. Use only Blue/Black Ball point pen.
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9. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except in the spaces allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
10. You have to return the Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. **You are, however, allowed to carry the test booklet and the duplicate copy of OMR Sheet** on conclusion of examination.
11. Use of any calculator, mobile phone or log table etc. is strictly prohibited.
12. **There is no negative marking.**

10-16

SEAL

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In solving transportation problem the _____ gives initial basic feasible solution obtained is very close to optimal solution.
(A) NWCM
(B) VAM
(C) LCM
(D) MODI

The addressing mode used for PUSH B is _____.
(A) Direct
(B) Indirect
(C) Register
(D) Index

3. When a program is being executed in an 8085 microprocessor, its PC contains :
(A) Total Number of instructions executed in the current program
(B) The address of the first instruction of the program
(C) Memory address of the instruction that is being currently executed
(D) Memory address of the next instruction that is to be executed

4. HLT instruction of 8085 microprocessor :
(A) Disconnects mircoprocessor from the system bus till the reset is pressed
(B) Halts execution of the program and returns to monitor
(C) Enters into a halt state and the buses are tri-stated
(D) Reloads the program

5. Which of the following is true ?
(A) Pentium IV microprocessor is extension of Pentium Pro microprocessor
(B) In Pentium IV microprocessor queues only instructions not microinstructions for execution
(C) In Pentium IV microprocessor CPUID gives vender ID info if the instruction is executed with 1 in EAX
(D) Pentium IV microprocessor does not require modified ATX power supply

6. Which of the following is not a module of Pentium 4 architecture ?
(A) Front end module
(B) Execution module
(C) Control module
(D) Memory subsystem module

7. CLASS A address use 7 bits for the <network> and bits for the <host> portion of the IP address :
(A) 16
(B) 24
(C) 32
(D) 64

8. Which of the following is reserved for multicasting ?
(A) Class B
(B) Class C
(C) Class D
(D) Class E

9. Which of the following is true or false ?
(i) In Class B addresses a total of more than 1 billion addresses can be formed
(ii) Class E addresses are reserved for future or experimental use.
(A) True, False
(B) True, True
(C) False, True
(D) False, False

10. What is the IEEE No. corresponding to IEEE 802 standards for Bluetooth ?
(A) 802.1
(B) 802.11
(C) 802.15.1
(D) 802.16

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11. _____ allows a user to access and change remote files without actual transfer ?

(A) DNS
(B) FTP
(C) NFS
(D) Telnet

12. A rubber company produces three types of tyres t1, t2, t3 at the company's two different plants. Plant 1 producing 50 tyres of type t1, 120 tyres of type t2, 150 tryes of type t3. Plant 2 producing 60 tyres of type t1, 100 tyres of type t2, 120 tyres of type t3. The monthly demand of tyre t1, t2, t3 is at least 30,000, 25,000, 20,000 units respectively. The monthly cost of operation of Plant 1 and Plant 2 is 20,000 and 25,000. The constraints are :

(A) 50 x1 + 60 x2 >= 30,000, 120 x1 + 100 x2 >= 25,000, 150 x1 + 120 x2 >=20,000
(B) 50 x1 + 60 x2 <= 30,000, 120 x1 + 100 x2 <= 25,000, 150 x1 + 120 x2 <=20,000
(C) 50 x1 + 60 x2 = 30,000, 120 x1 + 100 x2 = 25,000, 150 x1 + 120 x2 = 20,000
(D) 50 x1 + 60 x2 > 30,000, 120 x1 + 100 x2 > 25,000, 150 x1 + 120 x2 > 20,000

13. In an assignment problem drawing of horizontal and vertical lines to cover all zeros in reduced matrix involves one of the following :

(A) Mark (√) all rows that do not have assignment
(B) Mark (√) all columns that have zeros in the unmarked rows
(C) Mark (√) all rows that do not have assignment in marked column
(D) Draw straight lines through marked lines

14. Consider the following nonlinear optimization problem :

Maximize f(x)
subject to : $g_i(x) \leq 0, h_j(x) = 0$

where x is the optimization variable, $f : \mathbb{R}^n \rightarrow \mathbb{R}$ is the objective or cost function, $g_i : \mathbb{R}^n \rightarrow \mathbb{R}$ $g_i (i = 1, ..., m)$ are the inequality constraints functions, and $h_j : \mathbb{R}^n \rightarrow \mathbb{R}$ $h_j (j = 1, ..., l)$ are the equality constraints functions, f, g_i and h_j are continuously differentiable at a point x*. If x* is a local minimum that satisfies some regularity conditions (see below), then there exist constant μ_i (i = 1, ..., m) and λ_j (j = 1, ..., l), called KKT multipliers, such that $g_i(x^*) \leq 0$, for all i = 1, ..., m and $h_j(x^*) = 0$, for all j = 1, ..., l this property is termed as :

(A) Stationarity
(B) Primal feasibility
(C) Dual feasibility
(D) Complementary slackness

15. The first function-oriented metric was proposed by :

(A) Albrecht in the year 1990
(B) Pressman
(C) Albrecht in the year 1979
(D) Basili

16. Bottom up design is used in a situation when :

(A) Software is built using inbuilt small components
(B) Software need to design from scratch
(C) Requirement is not clear
(D) Software is complex

17. Which of the following is not the software maintenance category ?

(A) Perfective maintenance
(B) Corrective maintenance
(C) Adoptive maintenance
(D) E-maintenance

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18. In which of the following is not included as the prevention costs ?

(A) Test equipment

(B) Quality planning

(C) Formal technical reviews

(D) Cost to fix the bug

19. Which of the following is not a bug tracking tool ?

(A) Bugzilla

(B) Jira

(C) Mantis

(D) Bugger

20. Which of the following is user specific ?

(A) Availability

(B) Portability

(C) Maintainability

(D) Both (B) and (C)

21. Given the following statements :

S_1 : There exists a recursive language that is not context sensitive.

S_2 : Every context sensitive language L is recursive.

Which statement is correct ?

(A) S_1 is correct and S_2 is not correct

(B) S_1 is correct and S_2 is correct

(C) S_1 is not correct and S_2 is not correct

(D) S_1 is not correct and S_2 is correct

22. Match the following :

List–I	List–II
a. Chomsky Normal Form	i. $S \rightarrow 1\,S\,S \mid 0\,S \mid 2$
b. Greibach Normal Form	ii. $S \rightarrow 0\,S\,1 \mid 0\,1$
c. S-grammar	iii. $S \rightarrow A\,S \mid 0$, $A \rightarrow S\,A \mid 1$
d. LL grammar	iv. $S \rightarrow 0\,A\,S\,B$, $B \rightarrow 1$

Code :

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

23. Let L be any language. Define even (W) as the strings obtained by extracting from W the letters in the even numbered positions and even (L) = {even(W) | W ∈ L}. We define another language Chop (L) by removing the two leftmost symbols of every string in L given by Chop (L) = {W | $\forall$ W ∈ L with |v| = 2}. If L is regular then :

(A) Even (L) is regular and Chop (L) is not regular

(B) Both even (L) and Chop (L) are regular

(C) Even (L) is not regular and Chop (L) is regular

(D) Both even (L) and Chop (L) are not regular

24. Which of the following conversion is not possible algorithmically ?

(A) Non-deterministic finite state automaton to deterministic finite state automaton

(B) Regular grammar to context free grammar

(C) Non-deterministic pushdown automaton to deterministic pushdown automaton

(D) Non-deterministic Turing machine to deterministic Turing machine

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25. Context sensitive grammar can be recognized by a :
(A) Finite state machine
(B) Deterministic pushdown automaton
(C) Non-deterministic pushdown automaton
(D) Linear bounded automaton

26. The logic of pumping lemma is a good example of :
(A) Iteration
(B) Recursion
(C) Divide and conquer technique
(D) The Pigeon-hole principle

27. Given the following statements :
S_1 : The power of deterministic finite state machine and non-deterministic finite state machine are the same.
S_2 : The power of deterministic pushdown automaton machine and non-deterministic pushdown automaton machine are same.
Which of the following is correct ?
(A) S_1 is correct and S_2 is correct
(B) S_1 is correct and S_2 is not correct
(C) S_1 is not correct and S_2 is correct
(D) S_1 is not correct and S_2 is not correct

28. Let :
$L_1 = \{0^n 1^n 2^k \mid n; k = 1, 2, 3, ...\}$
$L_2 = \{0^n 1^k 2^k \mid n, k = 1, 2, 3, ...\}$
$L_3 = \{0^n 1^n 2^n \mid n = 1, 2, 3, ...\}$
Which of the following is correct ?
(A) $L_1 \subseteq L_3$ and $L_2 \subseteq L_3$
(B) L_1 and L_2 are not context free language and L_3 is a context free language
(C) $L_3 = \overline{L_1 \cup L_2}$
(D) L_1 and L_2 are context free language and L_3 is not a context free language

29. Given the recurrence relation :
$T(n) = T(\sqrt{n}) + 1$ if $n > 2$
$= 0$ if $n = 2$
The solution of recurrence relation is :
(A) $n \lg n$
(B) $\lg n$
(C) $(\lg n)^{\lg n}$
(D) $\lg(\lg n)$

30. If you use mergesort to sort an array with n elements, what is the worst case time required to sort ?
(A) $0(n^2)$
(B) $0(\lg n)$
(C) $0(n)$
(D) $0(n \lg n)$

31. Which of the following is not $0(n^2)$?
(A) $n + 10000\, n$
(B) $n^{1.9999}$
(C) $10^5 n + 2^6 n$
(D) $n^3 / \sqrt{n}$

32. There are 4 different algorithms A_1, A_2, A_3 and A_4 to solve a given problem with the order $\log(n)$, $\log(\log(n))$, $n \log(n)$ and $\frac{n}{\log(n)}$ respectively. Which is the worst algorithm ?
(A) A_1
(B) A_2
(C) A_3
(D) A_4

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33. Assuming there are n keys and each key is in the range [0, m – 1]. The run time of bucket sort is :
(A) 0 (n)
(B) 0 (n lg m)
(C) 0 (n lg n)
(D) 0 (n + m)

34. A _____ subset of vertices and a _____ complete subgraph of a graph G = (V, E) are a vertex cover and a clique respectively.
(A) minimal, maximal
(B) minimal, minimal
(C) maximal, maximal
(D) maximal, minimal

35. _____ is used in game trees to reduce the number of branches of the search tree to be traversed without affecting the solution.
(A) Min-max search
(B) Goal stack planning
(C) Best first search
(D) Alpha-beta pruning procedure

36. Which of the following points lies on the same side as the origin, with reference to the line $5x + 9y = 4$?
(A) (2, 0)
(B) (1, 0)
(C) (0.5, 0.5)
(D) (0.5, 0)

37. Which of the following statement(s) is/are true ?
(I) Two successive translations are additive
(II) Two successive rotations are additive
(III) Two successive scaling are additive
(A) (I) and (II)
(B) (I) and (III)
(C) (II) and (III)
(D) (I), (II) and (III)

38. Which statement about homogeneous coordinates is true ?
(A) It is a 2D representation of a 3D Cartesian point
(B) It is a 3D representation of a 2D Cartesian point
(C) It is used to represent matrices but cannot represent points or vectors
(D) It is a convenient way to deal with matrices additions but serves no purpose for matrices multiplication

39. The point (4, 1) undergoes the following three transformations successively :
(I) Reflection about the line $y = x$
(II) Translation through a distance of 2 units along the positive x-axis
(III) Rotation through an angle of 45° about the origin in the counter clockwise direction
The final position of the point will be :
(A) (2, 4)
(B) $\left(-\frac{3}{\sqrt{2}}, \frac{5}{\sqrt{2}}\right)$
(C) $\left(\frac{3}{\sqrt{2}}, -\frac{5}{\sqrt{2}}\right)$
(D) $\left(-\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$

40. Which of the following curves are symmetric about the line $y = x$?
(A) $y = |x|$
(B) $y = x^3$
(C) $x + y + 1 = 0$
(D) None of the above

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41. Which display device is best suited for CAD systems ?

(A) A CRT with vector refresh monitor

(B) LED display

(C) Plasma band display

(D) A CRT with raster scan monitor

42. Given $U = \{1, 2, 3, 4, 5, 6, 7\}$

$A = \{(3, 0.8), (5, 1), (6, 0.7)\}$

then $\tilde{A}$ will be : (Where $\sim \rightarrow$ complement)

(A) $\{(4, 0.7), (2, 1), (1, 0.8)\}$

(B) $\{(4, 0.3), (5, 0), (6, 0.3)\}$

(C) $\{(1, 1), (2, 1), (3, 0.2), (4, 1), (6, 0.3), (7)\}$

(D) $\{(3, 0.2), (6, 0.3)\}$

43. If A and B are two fuzzy sets with membership functions :

$\mu_A(x) = \{(1, 0.2), (2, 0.5), (3, 0.6), (4, 0.1), (5, 0.9)\}$

$\mu_B(x) = \{(1, 0.1), (2, 0.5), (3, 0.2), (4, 0.7), (5, 0.8)\}$

Then the value of $\mu_{\overline{A \wedge B}}$ will be :

(A) $\{(1, 0.2), (2, 0.5), (3, 0.6), (4, 0.7), (5, 0.9)\}$

(B) $\{(1, 0.2), (2, 0.5), (3, 0.2), (4, 0.1), (5, 0.8)\}$

(C) $\{(1, 0.1), (2, 0.5), (3, 0.2), (4, 0.1), (5, 0.8)\}$

(D) $\{(1, 0.9), (2, 0.5), (3, 0.8), (4, 0.9), (5, 0.2)\}$

44. Perceptron learning and Delta learning are learning methods which falls under the category of :

(A) Error correction learning

(B) Reinforcement learning

(C) Hebbian learning

(D) Competitive learning

45. Match the following :

	List–I		List–II
a.	Expert System	i.	Resolution
b.	Planning	ii.	Means-end analysis
c.	Prolog	iii.	Explanation facility
d.	Natural language processing	iv.	Pragmatics

Code :

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

46. Which of the following is the negation of the statement, "For all odd primes $p < q$ there exists positive non-primes $r < s$ such that $p^2 + q^2 = r^2 + s^2$" ?

(A) For all odd primes $p < q$ there exists positive non-primes $r < s$ such that $p^2 + q^2 \neq r^2 + s^2$

(B) There exists odd numbers $p < q$ such that for all positive non-primes $r < s$, $p^2 + q^2 = r^2 + s^2$

(C) There exists odd primes $p < q$ such that for all positive non-primes $r < s$, $p^2 + q^2 \neq r^2 + s^2$

(D) For all odd primes $p < q$ and for all positive non-primes $r < s$, $p^2 + q^2 \neq r^2 + s^2$

47. Which of the following is a solved cojecture ?

(A) $\forall\ m \in N, \exists\ n \geq m$, n odd, $\exists p, q \in P, n = p + q$

(B) $\forall\ m \in N, \exists\ n \geq m, n \in P$ and $n + 2 \in P$

(C) $\forall\ k \in N, \exists\ p \in P, p \geq k, 2p - 1 \in P$

(D) $\forall\ n \geq 4$, n even, $\exists p, q \in P, n = p + q$

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48. Thoma's write rule is _____.
(A) Two phase locking protocol
(B) Timestamp ordering protocol
(C) One phase locking protocol
(D) Sliding window protocol

49. The SQL expression :
Select distinct T.brnach_name
From branch T, branch S
Where T.assets>S.assets and S.branch_city="Mumbai"
Finds the names of :
(A) All branches that have greater assets than some branch located in Mumbai
(B) All branches that have greater assets than all branches in Mumbai
(C) The branch that has greatest asset in Mumbai
(D) Any branch that has greater assets than any branch in Mumbai

50. Which of the following group functions ignore NULL values ?
(A) MAX
(B) Count
(C) SUM
(D) All of these

51. Which of the following SQL commands can be used to modify existing data in a database table ?
(A) MODIFY
(B) UPDATE
(C) CHANGE
(D) NEW

52. Which normal form is considered adequate for relational database design ?
(A) 2 NF
(B) 3 NF
(C) 4 NF
(D) BCNF

53. The basic unit of ER model representation is :
(A) Entity
(B) Attribute
(C) Key
(D) Set

54. Which one of the following is a finite program ?
(A) Client Program
(B) Server Program
(C) DHCP Program
(D) None of the above

55. What are different types of Abstraction ?
(A) 4
(B) 5
(C) 3
(D) 2

56. Single inheritance, Multiple inheritance and Aggregation comes under _____.
(A) Modularity
(B) Typing
(C) Hierarchy
(D) None of the above

57. Who has written HTML ?
(A) Tim Berners-Lee
(B) Bill Gates
(C) Richard Stallman
(D) Vint-Cerf

58. Comment in XML document is given by :
(A) <!-- -->
(B) <?-- -->
(C) <!-- --!>
(D) </-- -- >

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59. What is the full form of DTD ?
(A) Document Type Definition
(B) Dynamic Type Definition
(C) Dynamic Text Definition
(D) Document Text Definition

60. By polymorphism of a subsystem we mean :
(A) It should be reusable
(B) It should have polymorphic data types
(C) It should accept generic commands and interpret appropriately
(D) It should morph polygons

61. The term _____ as used in data compression means truncate real value to an integer.
(A) Approximation
(B) Quantization
(C) Intuition
(D) Computation

62. A two dimensional DCT can be interpreted as (for an $n \times n$ image) :
(A) Basis of an $n \times n$ dimensional vector space
(B) A rotation of $n \times n$ matrix
(C) Convolution of $n \times n$ matrix
(D) Base of an $n^2 \times n^2$ dimensional vector space

63. If G is generator matrix of linear code and H is parity check matrix of the some linear code then $GH^T =$
(A) –1 only
(B) 1 only
(C) 0 only
(D) Any integer

64. The scheduler which selects which process to remove from memory by swapping :
(A) Short-term scheduler
(B) Long-term scheduler
(C) Dispatcher
(D) Medium term scheduler

65. In which CPU scheduling algorithm CPU is allocated to the process with highest priority ?
(A) Priority scheduling algorithm
(B) Shortest job first algorithm
(C) Round Robing
(D) None of the above

66. Time slot is used in which of the following algorithm :
(A) Round robin scheduling algorithm
(B) SJF algorithm
(C) Priority algorithm
(D) None of the above

67. The main job of dispatcher is to :
(A) Allocate different scheduler
(B) Allocate time slot to different processes
(C) Dispatch CPU to lowest process
(D) Gives control of the CPU to the process selected by the short-term scheduler

68. In operating system, resource allocation process means :
(A) Request for a resource
(B) Release the resource
(C) Use the resource
(D) All the mentioned above

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69. What is the condition for occurrence of deadlock ?

(A) Mutual exclusion and Circular Wait

(B) Hold and Wait

(C) No Preemption

(D) All the mentioned above

70. Ulimit command is used to :

(A) Set limit on file size

(B) Set limit on buffer size

(C) Set limit on directory

(D) Both (B) and (C)

71. Buffer cache is used for the following purpose :

(A) To increase the response time and throughput

(B) To increase the memory size

(C) Both (A) and (B)

(D) None of the above

72. The control character ctrl + d signal to :

(A) Duplicate string

(B) End of the input file

(C) End of a string

(D) Duplicate character

73. In JPEG compression of RGB color images, the pixels of each color component are organised in _____ pixels.

(A) 4×4

(B) 8×8

(C) 16×16

(D) 32×32

74. Which of the following is used for dictionary based compression ?

(A) LZ

(B) JPEG

(C) MPEG

(D) Huffman

75. If an image consists of $n \times n$ pixels and $n = 8$ m. Performing DCT for entire image would require $2 \times 8^3 \times k$ operations where k is :

(A) q

(B) q^2

(C) q^3

(D) q^4

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