Test Booklet Code & Serial No.
प्रश्नपत्रिका कोड व क्रमांक

**D**

## Paper-II
# COMPUTER SCIENCE AND APPLICATIONS

**Signature and Name of Invigilator**

1. (Signature) .........................................

   (Name) ..............................................

2. (Signature) .........................................

   (Name) ..............................................

Seat No. ☐☐☐☐☐

(In figures as in Admit Card)

Seat No. .............................................

(In words)

OMR Sheet No. ☐☐☐☐☐☐

**JUN - 37220**

(To be filled by the Candidate)

**Time Allowed : 2 Hours]**

**[Maximum Marks : 200**

Number of Pages in this Booklet : **28**

Number of Questions in this Booklet : **100**

| **Instructions for the Candidates** | **विद्यार्थ्यांसाठी महत्त्वाच्या सूचना** |
|---|---|
| 1. Write your Seat No. and OMR Sheet No. in the space provided on the top of this page. | 1. परीक्षार्थींनी आपला आसन क्रमांक या पृष्ठावरील वरच्या कोप-यात लिहावा. तसेच आपणांस दिलेल्या उत्तरपत्रिकेचा क्रमांक त्याखाली लिहावा. |
| 2. This paper consists of **100** objective type questions. Each question will carry *two* marks. *All* questions of Paper II will be compulsory. | 2. सदर प्रश्नपत्रिकेत 100 बहुपर्यायी प्रश्न आहेत. प्रत्येक प्रश्नास **दोन** गुण आहेत. या प्रश्नपत्रिकेतील **सर्व** प्रश्न सोडविणे अनिवार्य आहे. |
| 3. At the commencement of examination, the question booklet will be given to the student. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as follows : | 3. परीक्षा सुरु झाल्यावर विद्यार्थ्याला प्रश्नपत्रिका दिली जाईल. सुरुवातीच्या 5 मिनीटांमध्ये आपण सदर प्रश्नपत्रिका उघडून खालील बाबी अवश्य तपासून पहाव्यात. |
| (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal or open booklet. | (i) प्रश्नपत्रिका उघडण्यासाठी प्रश्नपत्रिकेवर लावलेले सील उघडावे. सील नसलेली किंवा सील उघडलेली प्रश्नपत्रिका स्विकारू नये. |
| (ii) Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to missing pages/questions or questions repeated or not in serial order or any other discrepancy should not be accepted and correct booklet should be obtained from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given. The same may please be noted. | (ii) पहिल्या पृष्ठावर नमूद केल्याप्रमाणे प्रश्नपत्रिकेची एकूण पृष्ठे तसेच प्रश्नपत्रिकेतील एकूण प्रश्नांची संख्या पडताळून पहावी. पृष्ठे कमी असलेली/कमी प्रश्न असलेली/प्रश्नांचा चुकीचा क्रम असलेली किंवा इतर त्रुटी असलेली सदोष प्रश्नपत्रिका सुरुवातीच्या 5 मिनिटातच पर्यवेक्षकाला परत देऊन दुसरी प्रश्नपत्रिका मागवून घ्यावी. त्यानंतर प्रश्नपत्रिका बदलून मिळणार नाही तसेच वेळही वाढवून मिळणार नाही याची कृपया विद्यार्थ्यांनी नोंद घ्यावी. |
| (iii) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet. | (iii) वरीलप्रमाणे सर्व पडताळून पाहिल्यानंतरच प्रश्नपत्रिकेवर ओ.एम.आर. उत्तरपत्रिकेचा नंबर लिहावा. |
| 4. Each question has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item. | 4. प्रत्येक प्रश्नासाठी (A), (B), (C) आणि (D) अशी चार विकल्प उत्तरे दिली आहेत. त्यातील योग्य उत्तराचा रकाना खाली दर्शविल्याप्रमाणे ठळकपणे काळा/निळा करावा. |
| **Example :** where (C) is the correct response. | **उदा. :** जर (C) हे योग्य उत्तर असेल तर. |
| Ⓐ Ⓑ ● Ⓓ | Ⓐ Ⓑ ● Ⓓ |
| 5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only.** If you mark at any place other than in the circle in the OMR Sheet, it will not be evaluated. | 5. या प्रश्नपत्रिकेतील प्रश्नांची उत्तरे **ओ.एम.आर. उत्तरपत्रिकेतच दर्शवावीत.** इतर ठिकाणी लिहिलेली उत्तरे तपासली जाणार नाहीत. |
| 6. Read instructions given inside carefully. | 6. आत दिलेल्या सूचना काळजीपूर्वक वाचाव्यात. |
| 7. Rough Work is to be done at the end of this booklet. | 7. प्रश्नपत्रिकेच्या शेवटी जोडलेल्या को-या पानावरच कच्चे काम करावे. |
| 8. If you write your Name, Seat Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space 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. | 8. जर आपण ओ.एम.आर. वर नमूद केलेल्या ठिकाणा व्यतिरिक्त इतर कोठेही नाव, आसन क्रमांक, फोन नंबर किंवा ओळख पटेल अशी कोणतीही खूण केलेली आढळून आल्यास अथवा असभ्य भाषेचा वापर किंवा इतर गैरमार्गाचा अवलंब केल्यास विद्यार्थ्याला परीक्षेस अपात्र ठरविण्यात येईल. |
| 9. You have to return original OMR Sheet to the invigilator 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 duplicate copy of OMR Sheet on conclusion of examination. | 9. परीक्षा संपल्यानंतर विद्यार्थ्याने मूळ ओ.एम.आर. उत्तरपत्रिका पर्यवेक्षकांकडे परत करणे आवश्यक आहे. तथापि, प्रश्नपत्रिका व ओ.एम.आर. उत्तरपत्रिकेची द्वितीय प्रत आपल्याबरोबर नेण्यास विद्यार्थ्यांना परवानगी आहे. |
| 10. Use only Blue/Black Ball point pen. | 10. फक्त निळ्या किंवा काळ्या बॉल पेनाचाच वापर करावा. |
| 11. Use of any calculator or log table, etc., is prohibited. | 11. कॅल्क्युलेटर किंवा लॉग टेबल वापरण्यास परवानगी नाही. |
| 12. There is no negative marking for incorrect answers. | 12. चुकीच्या उत्तरासाठी गुण कपात केली जाणार नाही. |

# Computer Science and Applications
## Paper II

**Time Allowed : 120 Minutes]**        **[Maximum Marks : 200**

**Note :** This Paper contains **One Hundred (100)** multiple choice questions. Each question carrying **Two (2)** marks. Attempt *All* questions.

1. A doubly linked list is :

   (A) A linear data structure

   (B) A non-linear data structure

   (C) Both linear and non-linear data structure

   (D) Neither linear nor non-linear data structure

2. Consider the usual algorithm for determining whether a sequence of parentheses is balanced.

   The maximum number of parentheses that appear on the stack AT ANY ONE TIME when the algorithm analyzes $\big(\ (\ )\ ((\ ))\ ((\ ))\ \big)$ is :

   (A) 12

   (B) 6

   (C) 3

   (D) 4

3. A queue data structure can be used for :

   (A) Resource allocation

   (B) Expression parsing

   (C) Recursion

   (D) Expression evaluation

4. The minimum number of nodes possible in a binary tree of height $h$ (assuming that the root is at height 1) is :

   (A) $h$

   (B) $2^h$

   (C) $2^{h-1}$

   (D) $2^h - 1$

5. If the in-order traversal output sequence of a binary tree is :

    D B E A F C

and its pre-order traversal output sequence is :

    A B D E C F

then its post-order traversal output sequence is :

(A) A B C D E F

(B) F E D C B A

(C) D E B F C A

(D) F E D C B A

6. Some differences between B tree and B$^+$ tree approaches are :

    (i) In a B tree, search keys and data are stored in internal or leaf nodes. But, in B$^+$ tree, data are stored only in leaf nodes.

    (ii) A link is maintained among all the nodes so that one can move from the left-most node to right-most node in B$^+$ tree.

(A) only (i) is correct

(B) only (ii) is correct

(C) Both (i) and (ii) are correct

(D) Both (i) and (ii) are incorrect

7. If $f(n) = 4n^2$ for all $n$ and $g(n) = n$ if $n > 100$ and $n^3$ if $n \leq 100$, then :

(A) $g(n)$ is of $O(f(n))$

(B) $g(n)$ is of $\Omega(f(n))$

(C) $f(n)$ is of $O(g(n))$

(D) $g(n)$ is of $\theta(f(n))$

8. Let $C^{\wedge}(x)$ denote the ranking function that associates cost with a node in Branch and Bound Formulation of Travelling Salesperson Problem. What is the value of $C^{\wedge}(x)$ for the root node for the following problem instance ?

|   | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | $\infty$ | 3 | 5 | 10 |
| 2 | 11 | $\infty$ | 6 | 8 |
| 3 | 16 | 7 | $\infty$ | 20 |
| 4 | 13 | 12 | 10 | $\infty$ |

(A) 26

(B) 29

(C) 31

(D) 36

9. Which amongst the following is *not* an NP-complete problem ?

(A) CNF satisfiability problem

(B) Clique decision problem

(C) Node Cover decision problem

(D) Halting problem

10. Consider the following segment of a parallel algorithm expressed in PRAM model of computing and allows concurrent read exclusive write model. What is the "Parallel time" complexity ?

For $k = m - 1$ step $- 1$ to 0 do
for all $j$, $2^k \leq j \leq 2^{k+1} - 1$, in parallel do
$A(j) = \max \{A(2j), A(2j + 1)\}$
where "max" is a function that find maximum of two numbers using single comparison operation.

(A)  $O(n^2)$

(B)  $O(n)$

(C)  $O(\log_2 n)$

(D)  $O(n \log_2 n)$

11. Which of the following languages are denoted/represented by the regular expression :

$\big((0 + 1)(0 + 1)^*\big)^*$ $00$ $(0 + 1)^*$

(i) The language contains strings over 0's and 1's with at least one pair of consecutive zeros.

(ii) The language contains strings over 0's and 1's with strings starting with either 0 or 1 and may end with 0 or 1.

(iii) The language contains strings over 0's and 1's with number of 0's to be more than number of 1's.

(A)  (ii) and (iii) only

(B)  (iii) only

(C)  (i) and (ii) only

(D)  (i) and (iii) only

12. Consider the grammar with productions :

$S \rightarrow aBDh$, $B \rightarrow cC$, $C \rightarrow bC/\in$,
$D \rightarrow EF$, $E \rightarrow g/\in$, $F \rightarrow f/\in$

Which of the following is *correct* set for FOLLOW (E) ?

(A)  {g, f, h, $}

(B)  {f, h, $}

(C)  {h, $}

(D)  {g, $, $\in$}

13. Which of the following is/are *correct* statement(s) :

(i) A language L is said to be a deterministic context free language if and only if there exists a deterministic $\rho$DA M such that :

$$L = L(M)$$

(ii) If every grammar that generates L is ambiguous, then the language is called inherently ambiguous.

(iii) A CFG is in Greibach Normal Form if all productions in G have the form $A \rightarrow BC$ and $A \rightarrow a$ where A, B, C are non-terminals and $a$ is a terminal.

(A)  (i) and (iii) only

(B)  (ii) and (iii) only

(C)  (i) and (ii) only

(D)  (i), (ii) and (iii) only

14. The process of computing an attribute and associating its computed value with the language construction is referred as ............ of the attribute.

   (A) Binding

   (B) Collision

   (C) Synthesizing

   (D) Chaining

15. ................. refers to the order in which individual statements or instructions of a program are executed.

   (A) Data flow

   (B) Control flow

   (C) Register allocation

   (D) Instruction scheduling

16. Match all items in Group 1 with correct options from Group 2 below :

   **Group 1**

   (*i*)   Regular expression

   (*ii*)  Pushdown automata

   (*iii*) Data flow analysis

   (*iv*)  Register allocation

   **Group 2**

   (1) Syntax analysis

   (2) Code generation

   (3) Lexical analysis

   (4) Code optimization

   (A) (*i*)—(4), (*ii*)—(1), (*iii*)—(2), (*iv*)—(3)

   (B) (*i*)—(3), (*ii*)—(1), (*iii*)—(4), (*iv*)—(2)

   (C) (*i*)—(3), (*ii*)—(4), (*iii*)—(1), (*iv*)—(2)

   (D) (*i*)—(2), (*ii*)—(1), (*iii*)—(4), (*iv*)—(3)

17. Which of the following is/are type of data supported/added by/in typical object file formats in code generation phase of a compiler ?

   (*i*)   Data segment

   (*ii*)  Block started by symbol

   (*iii*) Text segment

   (A)  (*i*) only

   (B)  (*ii*) and (*iii*) only

   (C)  (*i*), (*ii*) and (*iii*) only

   (D)  (*i*) and (*iii*) only

18. A synthesized attributes can be :

   (*i*)   Result of attribute evaluation rules.

   (*ii*)  The one whose value at a node in a parse tree is defined in terms of its sibling or parent.

   (*iii*) The one whose value at parent node can be determined from its children.

   (A)  (*i*) only

   (B)  (*i*) and (*iii*) only

   (C)  (*i*) and (*ii*) only

   (D)  (*ii*) and (*iii*) only

19. Which among the following is/are *correct* statement/statements ?

   (*i*)   A class of problems with two outputs "yes" or "no" is said to be decidable (solvable) if there exists some definite algorithm which always terminates (halts) with one of two outputs "yes" or "no". Otherwise, the class of problems is said to be undecidable.

   (*ii*)  A decision problem is a problem that requires a yes or no answer.

   (*iii*) Undecidable problem can be solved by a computer or a computer program of any kind.

   (A)  (*i*) and (*ii*) only

   (B)  (*i*) and (*iii*) only

   (C)  (*ii*) and (*iii*) only

   (D)  (*i*), (*ii*) and (*iii*) only

20. Which of the following production forms belongs to unrestricted grammar (Type 0) :

   (*i*)  S → ASA A → BCa BC → Aa

   (*ii*) S → aSa/∈

   (*iii*) BSA → aSb/ASB, A → aB/b

      B → Bb/a

   (A) (*i*) and (*iii*) only

   (B) (*ii*) and (*iii*) only

   (C) (*i*) and (*ii*) only

   (D) (*i*), (*ii*) and (*iii*) only

21. A noiseless channel with bandwidth of 3000 Hz transmitting a signal with four signal levels (for each level we send 2 bits). Then the maximum bit rate is :

   (A)  6,000 bps

   (B)  8,000 bps

   (C)  10,000 bps

   (D)  12,000 bps

22. What is the minimum Hamming distance for detection of six errors or correction of two errors ?

   (A) 7

   (B) 5

   (C) 3

   (D) 1

23. Find the class of the following two addresses :

   (*a*)  0000 0001 0000 1011 00001011

      11101111

   (*b*)  14.23.120.8

   (A) Class D, Class D

   (B) Class C, Class C

   (C) Class B, Class B

   (D) Class A, Class A

24. Imagine a flow specification that has a maximum packet size of 1000 bytes, a token bucket rate of 10 million bytes/sec, a token bucket size of 1 million bytes, and a maximum transmission rate of 50 million bytes/sec. How long can a burst at maximum speed last ?

(A) 50 sec

(B) 50 msec

(C) 25 sec

(D) 25 msec

25. In symmetric key cryptography, if every person in a group of 10 people needs to communicate with every other person in the group, how many secret keys are required ?

(A) 9

(B) 90

(C) 45

(D) 10

26. Which ARQ mechanism deals with the transmission of only damaged or lost frames despite the other multiple frames by increasing the efficiency and its utility in noisy channels ?

(A) Go-Back-N ARQ

(B) Selective Repeat ARQ

(C) Stop-and-Wait ARQ

(D) All of the above

27. The role of Common Gateway Interface (CGI) is to :

(A) Generate dynamic web pages

(B) Stream videos

(C) Program used to view html document

(D) Generate executable files from web content by web server

28. In virtual cluster management "templates" can be implemented using :

(A) Skip and relay format

(B) Copy and relay format

(C) NOW (newtor of workstation) format

(D) COW (copy on write) format

29. GSM is an example of :

(A) TDMA cellular systems

(B) FDMA cellular systems

(C) CDMA cellular systems

(D) SDMA cellular systems

30. The responsibility of a Certification Authority (CA) for Digital Signature is to authenticate the :

(A) hash function used

(B) private keys of subscribers

(C) key used in DES

(D) public keys of subscribers

31. A population of size 400, consists of 123 copies of genome 0001 (with fitness 0.12), 57 copies of genome 1111 (with fitness 0.23), 201 copies of genome 1010 (with fitness 0.56) and 19 copies of genome 0110 (with fitness 0.43). What is the estimated fitness of schema 1 *** ?

(A) 0.4870

(B) 0.4880

(C) 0.4877

(D) 0.5870

32. If $\underset{\sim}{A}$ = near 0.74 = $\left\{ \dfrac{0}{0.730} + \right.$

$\dfrac{0.8}{0.735} + \dfrac{1}{0.740} + \dfrac{0.6}{0.745} + \left. \dfrac{0}{0.750} \right\}$

and $\underset{\sim}{B}$ = in 0.74 = $\left\{ \dfrac{0}{0.730} + \right.$

$\dfrac{0.4}{0.735} + \dfrac{0.8}{0.740} + \dfrac{1}{0.745} + \left. \dfrac{0.6}{0.750} \right\}$

then $\overline{A \cup B}$ is :

(A) $\left\{ \dfrac{1}{0.730} + \dfrac{0.2}{0.735} + \dfrac{0}{0.740} + \right.$

$\left. \dfrac{0.4}{0.745} + \dfrac{1}{0.750} \right\}$

(B) $\left\{ \dfrac{1}{0.730} + \dfrac{0.6}{0.735} + \dfrac{0.2}{0.740} + \right.$

$\left. \dfrac{0}{0.745} + \dfrac{0.4}{0.750} \right\}$

(C) $\left\{ \dfrac{2}{0.730} + \dfrac{0.8}{0.735} + \dfrac{0.2}{0.740} + \right.$

$\left. \dfrac{0.4}{0.745} + \dfrac{0.6}{0.750} \right\}$

(D) $\left\{ \dfrac{1}{0.730} + \dfrac{0.2}{0.735} + \dfrac{0}{0.740} + \right.$

$\left. \dfrac{0}{0.745} + \dfrac{0.4}{0.750} \right\}$

33. Suppose the function $y$ and a fuzzy integer number around $- 4$ for X are given as :

$$y = (x - 3) 2 + 2$$

Around $- 4 = \{(2, 0.3), (3, 0.6), (4, 1), (5, 0.6), (6, 0.3)\}$ respectively, then $f$(Around $- 4$) is given by :

(A) $\{(2, 0.6), (3, 0.3), (6, 1), (11, 0.3)\}$

(B) $\{(2, 0.6), (3, 1), (6, 1), (11, 0.3)\}$

(C) $\{(2, 0.6), (3, 1), (6, 0.6), (11, 0.3)\}$

(D) $\{(2, 0.6), (3, 0.3), (6, 0.6), (11, 0.3)\}$

34. Which amongst the following are the four types of agents in Artificial Intelligence ?

(*i*) Simple reflex

(*ii*) Model based

(*iii*) Goal based

(*iv*) Action based

(*v*) Utility based

(*vi*) Learning action

(A) (*i*), (*ii*), (*iii*) and (*v*)

(B) (*i*), (*ii*), (*iii*) and (*iv*)

(C) (*ii*), (*iii*), (*iv*) and (*v*)

(D) (*iii*), (*iv*), (*v*) and (*vi*)

35. The ability to manipulate the existing knowledge representational structures to derive new structures, is known as :

(A) Representational adequacy

(B) Inferential adequacy

(C) Inferential efficiency

(D) Acquisitional efficiency

36. Which of the following is *not* true for STRIPS language used for planning ?

(A) There is no support for equality and types.

(B) The goals and effects are specified as conjunction.

(C) It uses open world assumption

(D) It uses only positive literals in states

37. In the source language, a single pronoun may stand for many things that require distinct pronouns in the target language. This difficulty in Natural language understanding encountered by machine translation systems is known as :

(A) Lexical disambiguation

(B) Grammatical ambiguity

(C) Anaphoric references

(D) Idioms

38. What are the two middle agents involved in a Distributed Environment Centered Agent Framework ?

(A) Dispatcher and Planner

(B) Matchmaker and Broker

(C) Dispatcher and Broker

(D) Scheduler and Broker

39. The activation levels of node in neural network depends on the activation function chosen. If it is a sigmoid function, then activation levels are :

(A) [0, 1]

(B) unrestricted

(C) $[-\infty, +\infty]$

(D) 0 (or − 1) and 1

40. We have to use a Hopfield network to store three vectors as follows :

(1, 1, 1, 1, 1)

(1, −1, −1, 1, −1)

(−1, 1, −1, −1, −1)

Find the weight matrix using outer products method :

(A) $\begin{bmatrix} 0 & -1 & 1 & 3 & 1 \\ -1 & 0 & 1 & -1 & 1 \\ 1 & 1 & 0 & 1 & 3 \\ 3 & -1 & 1 & 0 & 1 \\ 1 & 1 & 3 & 1 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 0 & -1 & -1 & 3 & 1 \\ -1 & 0 & 1 & -1 & 1 \\ 1 & 1 & 0 & 1 & 2 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \\ 3 & -1 & 1 \\ 2 & 1 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 3 & 1 \\ 1 & -1 & 1 \\ 0 & 1 & 3 \\ 1 & 0 & 1 \\ 3 & 1 & 0 \end{bmatrix}$

41.
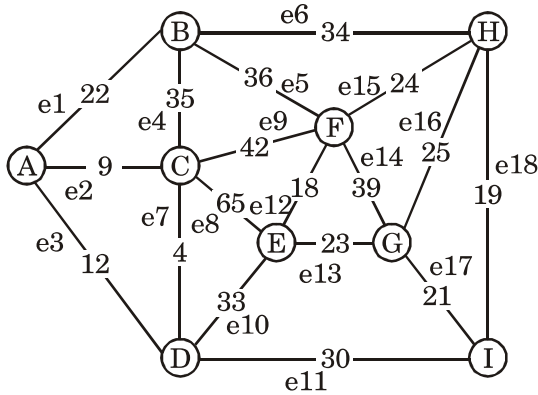


V = {A, B, C, D, E, F, G, H, I}

E = {e1 = (A, B), e2 = (A, C), e3 = (A, D),

e4 = (B, C), e5 = (B, F), e6 = (B, H),

e7 = (C, D), e8 = (C, E), e9 = (C, F),

e10 = (D, E), e11 = (D, I), e12 = (E, F),

e13 = (E, G), e14 = (F, G), e15 = (F, H),

e16 = (G, H), e17 = (G, I), e18 = (H, I)}

W = {22, 9, 12, 35, 36, 34, 4, 33, 30,

18, 23, 24, 39, 25, 21, 19}

........................ is a Eulerian path in

the above graph.

(A) e1, e6, e15, e9, e7, e10, e13, e17

(B) e2, e7, e11, e17, e13, e8, e9, e14,

e16, e6

(C) e3, e11, e17, e13, e8, e9, e14, e16,

e6, e4

(D) e10, e12, e14, e16, e18, e11, e3,

e1, e4

42. Group code set is built by using a generator G of size 5 × 8 with full rank. How many distinct words can be used for communication using these code set ?

(A) 32

(B) 16

(C) 8

(D) 4

43. The number of errors can be corrected using the code words of group code with the generator :

$$G = \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{vmatrix}$$

(A) 3

(B) 2

(C) 1

(D) 0

44. Let $f$ be a Boolean expression in 8 variables which has true value exactly for 4 combinations out of $2^8$ possible combinations. Then $f$ can be expressed as sum of .......... min terms.

(A) 10

(B) 8

(C) 6

(D) 4

45. A person with list of $n$ items, collects 1st item one (unit) time, 2nd item two (2 units) times, 3rd item three (3 units) times, ........ $r$th items $r$ times ($r$ units) ....... to his cart while going around the mart ......... number of units will be in his cart by the time he reaches to billing counter, if he has list of $6(n = 6)$ items for that day procurement.

(A) 6

(B) 14

(C) 21

(D) 42

46. Notation :

$C(n, r) = n!/(r!*(n - r)!))$

$n!$ is factorial $n$.

$|A|$ cardinality of set A

$\bar{s}$ is negation of $s$

The number of equivalence relations of order $n$ that can be defined over A of size $r = |A|$ $(r > n)$, is ..........

(A) $C(r - 1, n - 1)$

(B) $C(n + r - 1, n - 1)$

(C) $C(n + r - 1, r - 1)$

(D) $C(n - 1, r - 1)$

47. Consider the following Linear Programming Problem :

A company produces two types of hats say A and B. Each type A hat requires twice as much labour as type B. If all the hats are of type B only, the company can produce 500 hats a day. The market limits the sale of type A and type B hats to 150 and 250 respectively. If the profit earned on type A hat is ₹ 8 and type B hat is ₹ 5, how many hats of each type should be produced so as to maximize the profit ? The primal and dual of this problem is :

(A) Maximize : $Z = 8x_1 + 5x_2$
Subject to : $2x_1 + x_2 \leq 500$
$x_1 \leq 150$
$x_2 \leq 250$, $x_1, x_2 \geq 0$
Dual : Minimize :
$Z' = 500y_1 + 150y_2 + 250y_3$
Subject to : $2y_1 + y_2 \leq 8$
$y_1 + y_3 \leq 5$, $y_1, y_2 \geq 0$

(B) Maximize : $Z = 8x_1 + 5x_2$
Subject to : $2x_1 + x_2 \leq 500$
$x_1 \leq 150$
$x_2 \leq 250$, $x_1, x_2 \geq 0$
Dual : Minimize :
$Z' = 500y_1 + 150y_2 + 250y_3$
Subject to : $2y_1 + y_2 \geq 8$
$y_1 + y_3 \geq 5$, $y_1, y_2 \geq 0$

(C) Maximize : $Z = 8x_1 + 5x_2$
Subject to : $2x_1 + x_2 \leq 500$
$x_1 \leq 150$
$x_2 \leq 250$, $x_1, x_2 \geq 0$
Dual : Minimize : $Z' = 8y_1 + 5y_2$
Subject to : $2y_1 + y_2 \geq 500$
$y_1 \geq 150$
$y_2 \geq 250$, $y_1, y_2 \geq 0$

(D) Primal and dual are the same
Maximize : $Z = 8x_1 + 5x_2$
Subject to : $2x_1 + x_2 \leq 500$
$x_1 \leq 150$
$x_2 \leq 250$, $x_1, x_2 \geq 0$

48. The optimal solution of the linear programming problem is located :

(A) in the interior of the feasible region

(B) at the center of the feasible region

(C) at one of the corners of the feasible region

(D) on the surface of the feasible region

49. Consider the following transportation problem :

Destinations

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | |
|---|---|---|---|---|---|
| $S_1$ | 6 | 4 | 1 | 5 | 14 |
| $S_2$ | 8 | 9 | 2 | 7 | 16 |
| $S_3$ | 4 | 3 | 6 | 2 | 5 |
| | 6 | 10 | 15 | 4 | |

Sources

The initial transportation cost by Vogel's method is :

(A) 128

(B) 152

(C) 124

(D) 114

50. The Hungarian method for the assignment problem is based on the fact that :

(A) The optimal assignment is not affected if a constant is subtracted from any row or column

(B) The value of the objective function is not affected by adding or subtracting a constant from any row or column

(C) The optimal assignment is not affected by adding or subtracting a constant from any row or column

(D) The optimal assignment is not affected if each entry in the cost matrix is treated separately to obtain sufficient number of zeros

51. For even number of 1's at the input or inputs having all 0's, the output of EX-NOR gate is :

(A) Not defined

(B) High

(C) Low

(D) None of the above

52. Binary cyclic code :

(i) Detects all single errors.

(ii) Detects all odd number of error bits.

(iii) Detects all burst errors of 16 or fewer bits.

(A) Only (i)

(B) Only (ii)

(C) (ii) and (iii)

(D) (i), (ii) and (iii)

53. Using 16's complement method of subtraction compute $CB2_H - 972_H$ :

(A) $68D_H$

(B) $1340_H$

(C) $340_H$

(D) $CB2_H$

54. The minimum time required for memory device to put valid data on the data bus after $\overline{CS}$ goes low is called :

(A) $t_{ACS}$ : Chip select access time

(B) $t_{HZ}$ : Chip deselection to output in tri-state

(C) $t_{LZ}$ : Chip selection to output in tri-state

(D) $t_{AA}$ : Address access time

55. Determine the status of the condition flags if the operation performed on A and B is A $\wedge$ B where A = 01100010 and B = 01000101 :

(A) N = 1, V = 1, C = 0 and Z = 0

(B) N = 0, V = 0, C = 0 and Z = 1

(C) N = 1, V = 1, C = 1 and Z = 1

(D) N = 0, V = 0, C = 0 and Z = 0

56. If a byte is used as a storage unit, number 5 and character 5 in assembly language are stored as :

    (A) 00000101B and 00110101B

    (B) 01110101C and 00110101B

    (C) 00000011B and 00000101B

    (D) None of the above

57. Which one of the following is *not* a most common use of displacement addressing ?

    (A) Relative addressing

    (B) Base-register addressing

    (C) Indexing

    (D) Register-indirect addressing

58. One of the following *cannot* be classified as an Interrupt :

    (A) Priority

    (B) Daisy chaining

    (C) Non-maskable

    (D) Memory

59. Assume that an instruction pipeline has 5 stages without any branch prediction. Fetch Instruction (FI), Decode Instruction (DI), Fetch Operand (FO), Execute Instruction (EI) and Write Operand (WO) with state delays as 6, 8, 6, 5 and 4 ns respectively.

    Consider a program with 15 instructions ($I_1$ .... $I_{15}$) where only $I_7$ is a branch instruction and $I_{12}$ is the target instruction.

    If the branch is taken during execution of the program then what is the time needed to complete the program ?

    (A) $2^{10}$ns

    (B) $2^{16}$ns

    (C) $2^5$ns

    (D) 144ns

60. Which protocol is responsible for distributing the responsibility for maintaining cache coherence among all the cache controllers in a multiprocessor system ?

    (A) Snoopy protocol

    (B) Directory protocol

    (C) Write-back protocol

    (D) Write-through protocol

61. Objects life time generally corresponds to which storage allocation mechanism from the following :
    (*i*) Static objects
    (*ii*) Stack objects
    (*iii*) Heap objects
    (*iv*) Serialised objects
    (A) (*i*), (*ii*) and (*iv*)
    (B) (*i*), (*ii*) and (*iii*)
    (C) (*i*), (*iii*) and (*iv*)
    (D) (*ii*) and (*iii*)

62. Consider the following segment of 'C' programming code, upon execution it will produce output as :
    ```
    int main( )
    {
        auto int i=1;
        {   auto int i=2;
            {   auto int i=3;
                {   printf("\n%d", i);
                }
                print f("%d", i);
            }
            printf("d%", i);
        }
    }
    ```
    (A) 3 2 1
    (B) 3 3 2
    (C) 3 3 1
    (D) 3 1 2

63. Consider the following 'C' program fragment :
    ```
    int main( )
    {
        char *a, *b, c[10], d[10];
        a=b;
        b=c;
        c=d;
        d=a;
    return ϕ;
    }
    ```
    Choose the statement having error from the following :
    (A) b=c; and c=d;
    (B) a=b; and b=c;
    (C) c=d; and d=a;
    (D) a=b; and d=a;

64. In object oriented programming, an abstraction that holds a collection of objects of some given class is called :
    (*i*) Package list
    (*ii*) Container or collection
    (*iii*) Library
    (*iv*) Directory list
    (A) (*i*) and (*iii*)
    (B) (*ii*) only
    (C) (*i*) and (*iv*)
    (D) (*ii*) and (*iii*)

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65. Function declaration gives the name of the function. Which of the following statements are relevant for function :

(*i*)   The semantics of argument passing are identical to semantics of initialisation.

(*ii*)  The argument types are checked and implicit argument type conversion takes place when necessary.

(*iii*) The argument types are unchecked and explicit argument type conversion takes place when necessary.

(*iv*)  A function declaration may contain argument names

(A)  (*i*) and (*ii*)

(B)  (*i*), (*ii*) and (*iv*)

(C)  (*i*), (*ii*) and (*iii*)

(D)  (*ii*) and (*iv*)

66. Which of the following properties makes user defined class good ?

(*i*)   Something that has a small and well defined set of operations.

(*ii*)  Something that can be seen as a "Black Box" manipulated exclusively through that set of operations.

(*iii*) Something whose actual representation could conceivable be modified without affecting the way that set of operation is used.

(*iv*)  Something one might want more than one of.

(A)  (*ii*) and (*iii*)

(B)  (*i*), (*ii*), (*iii*) and (*iv*)

(C)  (*i*) and (*ii*)

(D)  (*iv*) only

67. Which action has the ability to match the request parameter to properties of some name in java bean be specifying "*" for attribute property ?

(A)  < jsp : include >

(B)  < jsp : set Property >

(C)  < jsp : use Bean >

(D)  < jsp : param >

68. Which of the following points lies over the line when Bresenham's line drawing algorithm is used to draw the line between the points (4, 6) and (15, 12) ?

   (A) (5, 6)

   (B) (7, 7)

   (C) (11, 9)

   (D) (13, 11)

69. Minimum and maximum window and viewport coordinates are (2, 4), (18, 30) and (8, 8), (16, 20) respectively. The scaling factors along $x$ and $y$ axes are :

   (A) 0.5 and 0.66

   (B) 0.25 and 0.5

   (C) 0.4 and 0.55

   (D) 2 and 1.5

70. From modeling coordinates to device coordinates in general 3D transformation pipeline, identify the correct order of other coordinates involved :

   (*i*) Viewing coordinates

   (*ii*) Projection coordinates

   (*iii*) World coordinates

   (A) (*i*), (*ii*) and (*iii*)

   (B) (*ii*), (*i*) and (*iii*)

   (C) (*iii*), (*i*) and (*ii*)

   (D) (*ii*), (*iii*) and (*i*)

71. Which of the following is *not* one of the Codd's rules ?

   (A) Everything in database must be stored in a table format.

   (B) Null values in database must be given a systematic and uniform treatment.

   (C) The structure definition stored in data dictionary should be accessible to all users

   (D) Database must support insertion, updation and deletion of a single row as also a set of records

72. Which of the following statements are *true* ?

   (*i*) Logical independence is the capacity to change the conceptual schema without having to change external schema.

   (*ii*) Logical independence is the capacity to change the conceptual schema without having to change internal schema.

   (*iii*) Physical independence is the capacity to change the internal schema without having to change conceptual schema.

   (*iv*) Physical independence is the capacity to change the conceptual schema without having to change external schema

   (A) (*i*) and (*iii*)

   (B) (*i*) and (*iv*)

   (C) (*ii*) and (*iii*)

   (D) (*ii*) and (*iv*)

73. In a schema with attributes A, B, C, D and E, with the following set of functional dependencies {A → B, A → C, CD → E, B → D, E → A}, which of the following functional dependencies are *not* implied by the above set ?

(A) CD → AC

(B) BD → CD

(C) BE → AD

(D) AB → CD

74. Database contains the relation course (Id, name, semester, year), which of the following is an *incorrect* SQL query ?

(A) Select * from course order by year;

(B) Select count(semester), semester from course group by semester;

(C) Select semester from course group by semester where count (semester) > z;

(D) Select count (semester), semester from course group by semester order by count (semester);

75. Which connective is used to test the absence of set membership in SQL ?

(A) minus

(B) not in

(C) intersection

(D) or

76. Which of the following are the lock modes in multiple granularity locking ?

(*i*) S

(*ii*) X

(*iii*) SIX

(*iv*) IX

(*v*) IS

(A) (*i*) and (*ii*)

(B) (*i*), (*ii*) and (*iii*)

(C) (*i*), (*ii*), (*iv*) and (*v*)

(D) (*i*), (*ii*), (*iii*), (*iv*) and (*v*)

77. The information gain, one of the attribute selection measures, used in partition of data (D), is expressed as

Info (D) = ..................

where $p_i$ is the probability that an arbitrary tuple in D belongs to class $c_i$ :

(A) $-\sum\limits_{i=1}^{m} p_i \log(p_i)$

(B) $\sum\limits_{i=1}^{m} p_i \log(p_i)$

(C) $-\sum\limits_{i=1}^{m} p_i \log_2(p_i)$

(D) $\sum\limits_{i=1}^{m} p_i \log_2(p_i)$

78. Which of the following is a method for mining frequent subgraphs ?

(*i*) Pattern growth approach.

(*ii*) Priori-based approach.

(A) (*i*) only

(B) (*ii*) only

(C) (*i*) and (*ii*)

(D) None of the above

79. Which among the following is *correct* sequence of data flow in Apached hadoop parallel MapReduce ?

(A) map, split, reduce, shuffle

(B) split, shuffle, map, reduce

(C) split, map, shuffle, reduce

(D) split, map, reduce, shuffle

80. For storing the information about networks, such as social connections, the stores used are ...............

(A) Key-value

(B) Graph

(C) Wide-column

(D) Document

81. 'Login-ID and Password' mechanism is implemented in an operating system to ensure which of the following aspects of security ?
    (A) Confidentiality
    (B) Integrity
    (C) Authentication
    (D) Authorization

82.
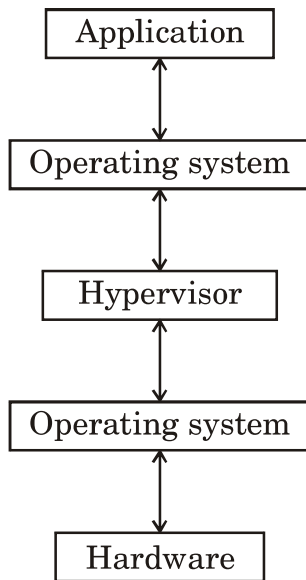


The given diagram represents which of the following scenario ?
    (A) Type 1 Hypervisor or virtual machine monitor
    (B) Type 2 Hypervisor or virtual machine monitor
    (C) Type 3 Hypervisor or virtual machine monitor
    (D) Type 4 Hypervisor or virtual machine monitor

83. What is the most appropriate purpose of 'kill' command in Linux ?
    (A) Kill a running process
    (B) Send a signal to a process
    (C) Abort a user login
    (D) Shutdown the operating system

84. Windows operating system follows ............... and Linux operating system follows ............. type of kernel architecture.

    Select most appropriate option from the following :
    (A) Monolithic, Micro
    (B) Hybrid, Monolithic
    (C) Micro, Monolithic
    (D) Micro, Micro

85. Which of the following scenario most appropriately depicts the primary use of a distributed file system ?
    (A) Store data and its backup on multiple computer systems
    (B) Access data stored on remote computer systems
    (C) Store parts of related data on different computer systems
    (D) Allow multiple file systems on one computer system

86. Consider a system with 12 magnetic tape drives and three processes $P_1$, $P_2$ and $P_3$. Process $P_1$ requires maximum 10 tape drives, $P_2$ may need 4 tape drives and $P_3$ may need upto 9 tape drives. Suppose at time $t_1$, process $P_1$ is holding 5 tape drives, process $P_2$ is holding 2 tape drives and process $P_3$ is holding 3 tape drives. At time $t_1$ the system is in :

(A) safe state

(B) unsafe state

(C) deadlocked state

(D) starvation state

87. In a demand paging memory system, page table is held in registers. The time taken to service a page fault is 8 m.sec. if an empty frame is available or if the replaced page is not modified, and it takes 20 m.sec. if the replaced page is modified. What is the average access time to service a page fault assuming that the page to be replaced is modified 70% of the times ?

(A) 11.6 m.sec.

(B) 16.4 m.sec.

(C) 28 m.sec.

(D) 14 m.sec.

88. A hierarchical memory system that uses cache memory has cache access time of 50 nano seconds, main memory access time of 300 nano seconds, 75% of memory requests are for read, hit ratio of 0.8 for read access and the write-through scheme is used. What will be the average access time of the system, both for read and write requests ?
(A) 157.5 nano sec.
(B) 110 nano sec.
(C) 75 nano sec.
(D) 82.5 nano sec.

89. Suppose a disk has 201 cylinders, numbered 0 to 200. At some time the disk arm is at cylinder 100, and there is a queue of disk access requests for cylinder 30, 85, 90, 100, 105, 110, 135 and 145. If shortest-seek time first (SSTF) is being used for scheduling the disk access the request for cylinder 90 is serviced after servicing ............ number of requests.
(A) 1
(B) 2
(C) 3
(D) 4

90. Let m[0] ...... m[4] be mutexes (binary semaphores) and P[0] ........ P[4] be processes. Suppose each process P[i] executes the following :
wait (m[i]); wait (m[(i+1) mod 4]);
........................
release (m[i]); release (m[(i+1) mod 4]);
This could be :
(A) Thrashing
(B) Deadlock
(C) Starvation but not deadlock
(D) None of the above

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91. Which one of these is appropriate in an agile and iterative software development process ?

    (A) Gather a complete set of requirements before designing/building anything

    (B) Implement the system incrementally, building it up bit by bit

    (C) Implement the backend of the system first, that is, before implementing the front-end functionality with which users interact

    (D) Generate and maintain complete, detailed design documents, which comprehensively model all aspects of the design

92. Which of the following provides a concise, unambiguous, and consistent method for documenting system requirements in software development process ?

    (A) CMM

    (B) ISO standard

    (C) CASE tools

    (D) Formal methods

93. Use-cases are not well suited for capturing ............. requirements.

    (A) functional

    (B) non-functional

    (C) user interaction

    (D) hardware interaction

94. The architectural model generally is derived from which of the following sources ?

    (i) Information about application domain for software.

    (ii) Data flow diagram or analysis classes (along with their relationships and collaborations)

    (iii) Availability of design patterns/frameworks

    (A) (i) and (ii) only but not (iii)

    (B) (i) and (iii) only but not (ii)

    (C) (ii) and (iii) only but not (i)

    (D) (i), (ii) and (iii)

95. FP based estimation decomposes problems based on :

    (A) Process activities

    (B) Project schedule

    (C) Information

    (D) Software procedures

96. Assume that the size of an organic type software product has been estimated to be 34,000 lines of source code. Assume that the average salary of software engineers is ₹ 20,000 per month. Determine the effort and cost required to develop the software product along with the nominal development time.

    (A) 91 PM, 210,000, 14 months

    (B) 97 PM, 280,000, 14 months

    (C) 91 PM, 280,000, 14 months

    (D) 97 PM, 210,000, 12 months

97. The concurrent version system (CVS) is widely used for version control, where it is originally designed for source code, but useful for any text-based file, then CVS system must perform :

(*i*) Establishing a simple repository.

(*ii*) Maintains all version of a file in a single named file by storing only the difference between progressive version of the original file.

(*iii*) Protect against simultaneous changes to a file by establishing different directories for each developer thus insulating one from another.

(*iv*) The CVS merges changes when each developer completes the work.

(A) (*i*), (*ii*) and (*iii*)

(B) (*i*), (*ii*), (*iii*) and (*iv*)

(C) (*i*), (*ii*) and (*iv*)

(D) (*ii*), (*iii*) and (*iv*)

98. Suppose a graph has 5 flow graph edges and 3 flow graph modes, the cyclometric complexity V(G) of flow graph G is ..............

(A) –2

(B) 2

(C) 4

(D) 8

99. Which is/are the *false* statement(s) about alpha test ?

(*i*) It is conducted by developers.

(*ii*) It is conducted in controlled environment.

(*iii*) It is conducted on live application.

(A) (*i*) and (*ii*)

(B) (*i*) and (*iii*)

(C) (*ii*) and (*iii*)

(D) (*iii*) only

100. Which amongst the following are McCalls production transition factors ?

(*i*) Reliability

(*ii*) Portability

(*iii*) Testability

(*iv*) Reusability

(A) (*i*) and (*ii*)

(B) (*ii*) and (*iii*)

(C) (*ii*) and (*iv*)

(D) (*i*) and (*iii*)

ROUGH WORK

[P.T.O.

**ROUGH WORK**