Signature and Name of Invigilator

1. (Signature) _____

   (Name) _____

2. (Signature) _____

   (Name) _____

OMR Sheet No. : .....
(To be filled by the Candidate)

Roll No. | | | | | | | | | |
(In figures as per admission card)

PAPER - III **Roll No.** _____
(In words)

D 8 7 1 5

COMPUTER SCIENCE AND APPLICATIONS

Time : 2½ hours] **[Maximum Marks : 150**

Number of Pages in this Booklet : **16**

Number of Questions in this Booklet : **75**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of seventy five multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (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 and do not accept an open booklet.
   (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 pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the Test Booklet Number should be entered on the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (1), (2), (3) and (4). You have to darken the circle as indicated below on the correct response against each item.

   Example : ① ② ● ④ where (3) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only.** If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll 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, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
9. 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 original question booklet and duplicate copy of OMR Sheet on conclusion of examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There are no negative marks for incorrect answers.**

परीक्षार्थियों के लिए निर्देश

1. इस पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए।
2. इस प्रश्न-पत्र में पचहत्तर बहुविकल्पीय प्रश्न हैं।
3. परीक्षा प्रारम्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी। पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निम्नलिखित जाँच के लिए दिये जायेंगे, जिसकी जाँच आपको अवश्य करनी है :
   (i) प्रश्न-पुस्तिका खोलने के लिए पुस्तिका पर लगी कागज की सील को फाड़ लें। खुली हुई या बिना स्टीकर-सील की पुस्तिका स्वीकार न करें।
   (ii) **कवर पृष्ठ पर छपे निर्देशानुसार प्रश्न-पुस्तिका के पृष्ठ तथा प्रश्नों की संख्या को अच्छी तरह चैक कर लें कि ये पूरे हैं। दोषपूर्ण पुस्तिका जिनमें पृष्ठ/प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात किसी भी प्रकार की त्रुटिपूर्ण पुस्तिका स्वीकार न करें तथा उसी समय उसे लौटाकर उसके स्थान पर दूसरी सही प्रश्न-पुस्तिका ले लें। इसके लिए आपको पाँच मिनट दिये जायेंगे। उसके बाद न तो आपकी प्रश्न-पुस्तिका वापस ली जायेगी और न ही आपको अतिरिक्त समय दिया जायेगा।**
   (iii) इस जाँच के बाद प्रश्न-पुस्तिका का नंबर OMR पत्रक पर अंकित करें और OMR पत्रक का नंबर इस प्रश्न-पुस्तिका पर अंकित कर दें।
4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (1), (2), (3) तथा (4) दिये गये हैं। आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है।

   उदाहरण : ① ② ● ④ जबकि (3) सही उत्तर है।
5. प्रश्नों के उत्तर **केवल प्रश्न पुस्तिका के अन्दर दिये गये OMR पत्रक पर ही** अंकित करने हैं। यदि आप OMR पत्रक पर दिये गये वृत्त के अलावा किसी अन्य स्थान पर उत्तर चिन्हांकित करते हैं, तो उसका मूल्यांकन नहीं होगा।
6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें।
7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें।
8. यदि आप OMR पत्रक पर नियत स्थान के अलावा अपना नाम, रोल नम्बर, फोन नम्बर या कोई भी ऐसा चिह्न जिससे आपकी पहचान हो सके, अंकित करते हैं अथवा अभद्र भाषा का प्रयोग करते हैं, या कोई अन्य अनुचित साधन का प्रयोग करते हैं, जैसे कि अंकित किये गये उत्तर को मिटाना या सफेद स्याही से बदलना तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं।
9. आपको परीक्षा समाप्त होने पर मूल OMR पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें। हालांकि आप परीक्षा समाप्ति पर मूल प्रश्न-पुस्तिका तथा OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं।
10. **केवल नीले/काले बाल प्वाईंट पेन का ही इस्तेमाल करें।**
11. **किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है।**
12. **गलत उत्तरों के लिए कोई नकारात्मक अंक नहीं हैं।**

COMPUTER SCIENCE AND APPLICATIONS

PAPER - III

Note : This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are **compulsory**.

1. The three outputs $x_1x_2x_3$ from the 8×3 priority encoder are used to provide a vector address of the form $101x_1x_2x_300$. What is the second highest priority vector address in hexadecimal if the vector addresses are starting from the one with the highest priority ?

(1) BC (2) A4 (3) BD (4) AC

2. What will be the output at PORT1 if the following program is executed ?

```
MVI B, 82H
MOV A, B
MOV C, A
MVI D, 37H
OUT PORT1
HLT
```

(1) 37H (2) 82H (3) B9H (4) 00H

3. Which of the following 8085 microprocessor hardware interrupt has the lowest priority ?

(1) RST 6.5 (2) RST 7.5 (3) TRAP (4) INTR

4. A dynamic RAM has refresh cycle of 32 times per msec. Each refresh operation requires 100 nsec and a memory cycle requires 250 nsec. What percentage of memory's total operating time is required for refreshes ?

(1) 0.64 (2) 0.96 (3) 2.00 (4) 0.32

5. A DMA controller transfers 32-bit words to memory using cycle Stealing. The words are assembled from a device that transmits characters at a rate of 4800 characters per second. The CPU is fetching and executing instructions at an average rate of one million instructions per second. By how much will the CPU be slowed down because of the DMA transfer ?

(1) 0.06% (2) 0.12% (3) 1.2% (4) 2.5%

6. A CPU handles interrupt by executing interrupt service subroutine _____.

(1) by checking interrupt register after execution of each instruction

(2) by checking interrupt register at the end of the fetch cycle

(3) whenever an interrupt is registered

(4) by checking interrupt register at regular time interval

7. Given the following set of prolog clauses :
father(X, Y) :
parent(X, Y),
male(X),
parent(Sally, Bob),
parent(Jim, Bob),
parent(Alice, Jane),
parent(Thomas, Jane),
male(Bob),
male(Jim),
female(Salley),
female(Alice).
How many atoms are matched to the variable 'X' before the query father(X, Jane) reports a Result ?
(1) 1 (2) 2 (3) 3 (4) 4

8. Forward chaining systems are _____ where as backward chaining systems are _____.
(1) Data driven, Data driven (2) Goal driven, Data driven
(3) Data driven, Goal driven (4) Goal driven, Goal driven

9. Match the following w.r.t. programming languages :

	List - I		List - II
(a)	JAVA	(i)	Dynamically object oriented
(b)	Python	(ii)	Statically Non-object oriented
(c)	Prolog	(iii)	Statically object oriented
(d)	ADA	(iv)	Dynamically non-object oriented

Codes :

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(ii)	(iv)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(i)	(iii)	(iv)	(ii)
(4)	(ii)	(iv)	(i)	(iii)

10. The combination of an IP address and a port number is known as _____.
(1) network number (2) socket address
(3) subnet mask number (4) MAC address

11. A network with bandwidth of 10 Mbps can pass only an average of 15,000 frames per minute with each frame carrying an average of 8,000 bits. What is the throughput of this network ?
(1) 2 Mbps (2) 60 Mbps (3) 120 Mbps (4) 10 Mbps

12. Consider a subnet with 720 routers. If a three-level hierarchy is choosen with eight clusters, each containing 9 regions of 10 routers, then total number of entries in the routing table is _____.
(1) 25 (2) 27 (3) 53 (4) 72

13. In a classful addressing, the IP addresses with 0 (zero) as network number :

(1) refers to the current network
(2) refers to broadcast on the local network
(3) refers to broadcast on a distant network
(4) refers to loopback testing

14. In electronic mail, which of the following protocols allows the transfer of multimedia messages ?

(1) IMAP (2) SMTP (3) POP 3 (4) MIME

15. A device is sending out data at the rate of 2000 bps. How long does it take to send a file of 1,00,000 characters ?

(1) 50 (2) 200 (3) 400 (4) 800

16. In Activity - Selection problem, each activity i has a start time s_i and a finish time f_i where $s_i \le f_i$. Activities i and j are compatible if :

(1) $s_i \ge f_j$ (2) $s_j \ge f_i$ (3) $s_i \ge f_j$ or $s_j \ge f_i$ (4) $s_i \ge f_j$ and $s_j \ge f_i$

17. Given two sequences X and Y :

$X = \langle a, b, c, b, d, a, b \rangle$

$Y = \langle b, d, c, a, b, a \rangle$.

The longest common subsequence of X and Y is :

(1) $\langle b, c, a \rangle$ (2) $\langle c, a, b \rangle$ (3) $\langle b, c, a, a \rangle$ (4) $\langle b, c, b, a \rangle$

18. If there are n integers to sort, each integer has d digits and each digit is in the set {1, 2, ..., k}, radix sort can sort the numbers in :

(1) O(d n k) (2) $O(d\ n^k)$ (3) O((d + n)k) (4) O(d(n + k))

19. The solution of the recurrence relation

$$T(n) \le \begin{cases} \theta(1) & \text{if } n \le 80 \\ T\left(\frac{n}{s}\right) + T\left(\frac{7n}{10} + 6\right) + O(n) & \text{if } n > 80 \end{cases}$$

is :

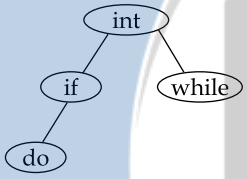
(1) O(lg n) (2) O(n)
(3) O(n lg n) (4) None of the above

20. Floyd-Warshall algorithm utilizes _____ to solve the all-pairs shortest paths problem on a directed graph in _____ time.

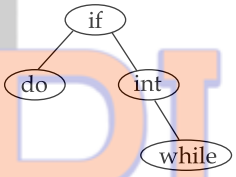
(1) Greedy algorithm, $\theta(V^3)$ (2) Greedy algorithm, $\theta(V^2 \lg n)$
(3) Dynamic programming, $\theta(V^3)$ (4) Dynamic programming, $\theta(V^2 \lg n)$

21. Let $n = 4$ and $(a_1, a_2, a_3, a_4) = (do, if, int, while)$. Let $p(1:4) = \left(\frac{3}{8}, \frac{3}{8}, \frac{1}{8}, \frac{1}{8}\right)$ and $q(1:4) = \left(\frac{2}{8}, \frac{3}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}\right)$ where p(i) and q(i) denotes the probability with which we search a_i and the identifier x being searched satisfy $a_i < x < a_{i+1}$ respectively. The optimal search tree is given by :

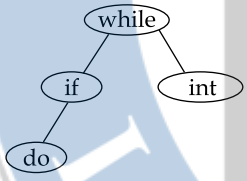
(1)



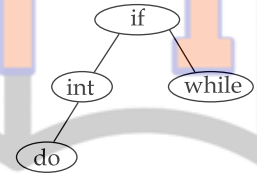
(2)



(3)



(4)



22. The family of context sensitive languages is _____ under union and _____ under reversal.

(1) closed, not closed (2) not closed, not closed
(3) closed, closed (4) not closed, closed

23. Match the following :

	List - I		**List - II**
(a)	$\{a^n b^n \mid n > 0\}$ is a deterministic context free language	(i)	but not recursive language
(b)	The complement of $\{a^n b^n a^n \mid n > 0\}$ is a context free language	(ii)	but not context free language
(c)	$\{a^n b^n a^n\}$ is context sensitive language	(iii)	but can not be accepted by a deterministic pushdown automation
(d)	L is a recursive language	(iv)	but not regular

Codes :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iv)	(iii)	(i)	(ii)

24. The language of all non-null strings of a's can be defined by a context free grammar as follow :

$S \rightarrow a\ S \mid S\ a \mid a$

The word a^3 can be generated by _____ different trees.

(1) Two (2) Three (3) Four (4) Five

25. Which one of the following non-functional quality attributes is not highly affected by the architecture of the software ?

(1) Performance (2) Reliability
(3) Usability (4) Portability

26. The context free grammar given by

$S \rightarrow XYX$
$X \rightarrow aX \mid bX \mid \lambda$
$Y \rightarrow bbb$

generates the language which is defined by regular expression :

(1) $(a+b)^*bbb$ (2) $abbb(a+b)^*$
(3) $(a+b)^*(bbb)(a+b)^*$ (4) $(a+b)(bbb)(a+b)^*$

27. There are exactly _____ different finite automata with three states x, y and z over the alphabet {a, b} where x is always the start state.

(1) 64 (2) 256 (3) 1024 (4) 5832

28. Given the following two languages :

$L_1 = \{a^n\ b\ a^n \mid n > 0\}$
$L_2 = \{a^n\ b\ a^n\ b^{n+1} \mid n > 0\}$

Which of the following is **correct** ?

(1) L_1 is context free language and L_2 is not context free language
(2) L_1 is not context free language and L_2 is context free language
(3) Both L_1 and L_2 are context free languages
(4) Both L_1 and L_2 are not context free languages

29. Which of the following is used to make an Abstract class ?

(1) Making atleast one member function as pure virtual function
(2) Making atleast one member function as virtual function
(3) Declaring as Abstract class using virtual keyword
(4) Declaring as Abstract class using static keyword

30. Match the following with reference to object oriented modelling :

List - I		**List - II**
(a) Polymorphism	(i)	Picking both operator and attributes with operations appropriate to model an object
(b) Inheritance	(ii)	Hiding implementation details of methods from users of objects
(c) Encapsulation	(iii)	Using similar operations to do similar things
(d) Abstraction	(iv)	Create new classes from existing class

Codes :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iii)	(i)	(ii)	(iv)
(4)	(iv)	(iii)	(ii)	(i)

31. In CRC based design, a CRC Team consists of :

(a) one or two users representatives
(b) several programmers
(c) project co-ordinators
(d) one or two system analysts

Codes :

(1) (a) and (c) (2) (a), (b), (c) and (d)
(3) (a), (c) and (d) (4) (a), (b) and (d)

32. The end points of a given line are (0, 0) and (6, 18). Compute each value of y as x steps from 0 to 3, by using equation of straight line :

(1) For $x=0$, $y=0$; $x=1$, $y=3$; $x=2$, $y=6$; $x=3$, $y=9$
(2) For $x=0$, $y=1$; $x=1$, $y=3$; $x=2$, $y=4$; $x=3$, $y=9$
(3) For $x=0$, $y=2$; $x=1$, $y=3$; $x=2$, $y=6$; $x=3$, $y=9$
(4) For $x=0$, $y=0$; $x=1$, $y=3$; $x=2$, $y=4$; $x=3$, $y=6$

33. Which of the following graphic primitives are considered as the basic building blocks of computer graphics ?

(a) Points (b) Lines (c) Polylines (d) Polygons

Codes :

(1) (a) only (2) (a) and (b)
(3) (a), (b) and (c) (4) (a), (b), (c) and (d)

34. Javascript and Java has similar name because _____ is/are true.

(a) Javascripts syntax is loosely based on Java's syntax
(b) Javascript is stripped down version of Java
(c) Java and Javascript are originated from Island of Java

Codes :

(1) (a) only (2) (a), (b) and (c) (3) (a) and (b) (4) (a) and (c)

35. Which of the following statements are true with reference to the way of describing XML data ?

(a) XML uses DTD to describe the data
(b) XML uses XSL to describe the data
(c) XML uses a description node to describe the data

Codes :

(1) (a) only (2) (b) only (3) (a) and (b) (4) (a) and (c)

36. Which of the following is/are **correct** with reference to Abstract class and interface ?

(a) A class can inherit only one Abstract class but may inherit several interfaces.
(b) An Abstract class can provide complete and default code but an interface has no code.

Codes :

(1) (a) is true (2) (b) is true
(3) Both (a) and (b) are true (4) Neither (a) nor (b) is true

37. Match the following with respect to various memory management algorithms :

List - I		List - II	
(a)	Demand paging	(i)	degree of multiprogramming
(b)	Segmentation	(ii)	working set
(c)	Dynamic partitions	(iii)	supports user view of memory
(d)	Fixed partitions	(iv)	compaction

Codes :

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(ii)	(i)
(2)	(ii)	(iii)	(i)	(iv)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(ii)	(iii)	(iv)	(i)

38. Function of memory management unit is :

(1) Address translation (2) Memory allocation
(3) Cache management (4) All of the above

39. Consider a system with twelve magnetic tape drives and three processes P_1, P_2 and P_3. Process P_1 requires maximum ten tape drives, process P_2 may need as many as four tape drives and P_3 may need upto nine tape drives. Suppose that at time t_1, process P_1 is holding five tape drives, process P_2 is holding two tape drives and process P_3 is holding three tape drives. At time t_1, system is in :

(1) safe state (2) unsafe state (3) deadlocked state (4) starvation state

40. In Unix operating system, special files are used to :

(1) buffer data received in its input from where a process reads
(2) provide a mechanism to map physical device to file names
(3) store list of file names plus pointers associated with i-nodes
(4) store information entered by a user application program or utility program

41. Match the following in Unix file system :

List - I		List - II	
(a)	Boot block	(i)	Information about file system
(b)	Super block	(ii)	Information about file
(c)	Inode table	(iii)	Storage space
(d)	Data block	(iv)	Code for making OS ready

Codes :

	(a)	(b)	(c)	(d)
(1)	(iv)	(i)	(ii)	(iii)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(iii)	(i)	(ii)	(iv)
(4)	(iv)	(ii)	(i)	(iii)

42. In an operating system, indivisibility of operation means :
(1) Operation is interruptable
(2) Race - condition may occur
(3) Processor can not be pre-empted
(4) All of the above

43. A horn clause is _____.
(1) A clause in which no variables occur in the expression
(2) A clause that has at least one negative literal
(3) A disjunction of a number of literals
(4) A clause that has at most one positive literal

44. In Propositional Logic, given P and $P \rightarrow Q$, we can infer _____.
(1) $\sim Q$ (2) Q (3) $P \wedge Q$ (4) $\sim P \wedge Q$

45. Reasoning strategies used in expert systems include _____.
(1) Forward chaining, backward chaining and problem reduction
(2) Forward chaining, backward chaining and boundary mutation
(3) Forward chaining, backward chaining and back propagation
(4) Backward chaining, problem reduction and boundary mutation

46. Language model used in LISP is _____.
(1) Functional programming (2) Logic programming
(3) Object oriented programming (4) All of the above

47. In constraint satisfaction problem, constraints can be stated as _____.
(1) Arithmatic equations and inequalities that bind the values of variables
(2) Arithmatic equations and inequalities that doesn't bind any restriction over variables
(3) Arithmatic equations that impose restrictions over variables
(4) Arithmatic equations that discard constraints over the given variables

48. As compared to rental and leasing methods to acquire computer systems for a Management Information System (MIS), purchase method has following advantage :
(1) It has high level of flexibility
(2) It doesn't require cash up-front
(3) It is a business investment
(4) Little risk of obsolescence

49. Consider the conditional entropy and mutual information for the binary symmetric channel. The input source has alphabet $X = \{0, 1\}$ and associated probabilities $\left\{\frac{1}{2}, \frac{1}{2}\right\}$. The channel matrix is $\begin{pmatrix} 1-p & p \\ p & 1-p \end{pmatrix}$ where p is the transition probability. Then the conditional entropy is given by :
(1) 1 (2) $-p\log(p) - (1-p)\log(1-p)$
(3) $1 + p\log(p) + (1-p)\log(1-p)$ (4) 0

50. Which of the following is **not** a lossy compression technique ?
(1) JPEG (2) MPEG (3) FFT (4) Arithmetic coding

51. Blind image deconvolution is _____.
(1) Combination of blur identification and image restoration
(2) Combination of segmentation and classification
(3) Combination of blur and non-blur image
(4) None of the above

52. A basic feasible solution of a linear programming problem is said to be _____ if at least one of the basic variable is zero.
(1) degenerate (2) non-degenerate (3) infeasible (4) unbounded

53. Consider the following conditions :
(a) The solution must be feasible, i.e. it must satisfy all the supply and demand constraints.
(b) The number of positive allocations must be equal to $m+n-1$, where m is the number of rows and n is the number of columns.
(c) All the positive allocations must be in independent positions.
The initial solution of a transportation problem is said to be non-degenerate basic feasible solution if it satisfies :
Codes :
(1) (a) and (b) only (2) (a) and (c) only
(3) (b) and (c) only (4) (a), (b) and (c)

54. Consider the following transportation problem :

Factories	Stores				
		I	II	III	IV	Supply
	A	4	6	8	13	50
	B	13	11	10	8	70
	C	14	4	10	13	30
	D	9	11	13	8	50
	Demand	25	35	105	20	

The transportation cost in the initial basic feasible solution of the above transportation problem using Vogel's Approximation method is :
(1) 1450 (2) 1465 (3) 1480 (4) 1520

55. The character set used in Windows 2000 operating system is _____.
(1) 8 bit ASCII (2) Extended ASCII
(3) 16 bit UNICODE (4) 12 bit UNICODE

56. In Unix, the command to enable execution permission for file "mylife" by all is _____.
(1) Chmod ugo + X myfile (2) Chmod a + X myfile
(3) Chmod + X myfile (4) All of the above

57. What will be the output of the following Unix command ?

$rm chap0\[1 - 3\]

(1) Remove file chap0[1 - 3]
(2) Remove file chap01, chap02, chap03
(3) Remove file chap\[1 - 3\]
(4) None of the above

58. Which of the following statements regarding the features of the object-oriented approach to databases are **true** ?

(a) The ability to develop more realistic models of the real world.
(b) The ability to represent the world in a non-geometric way.
(c) The ability to develop databases using natural language approaches.
(d) The need to split objects into their component parts.
(e) The ability to develop database models based on location rather than state and behaviour.

Codes :

(1) (a), (b) and (c) (2) (b), (c) and (d) (3) (a), (d) and (e) (4) (c), (d) and (e)

59. Consider the following database table :

```
Create table test(
        one integer,
        two integer,
        primary key(one),
        unique(two),
        check(one>=1 and <=10),
        check(two>=1 and <=5)
        );
```

How many data records/tuples atmost can this table contain ?

(1) 5 (2) 10 (3) 15 (4) 50

60. Suppose ORACLE relation R(A, B) currently has tuples {(1, 2), (1, 3), (3, 4)} and relation S(B, C) currently has {(2, 5), (4, 6), (7, 8)}. Consider the following two SQL queries SQ1 and SQ2 :

```
SQ1 : Select *
      From R Full Join S
      On R.B=S.B;
SQ2 : Select *
      From R Inner Join S
      On R.B=S.B;
```

The numbers of tuples in the result of the SQL query SQ1 and the SQL query SQ2 are given by :

(1) 2 and 6 respectively
(2) 6 and 2 respectively
(3) 2 and 4 respectively
(4) 4 and 2 respectively

61. Consider the following three SQL queries (Assume the data in the people table) :

(a) Select Name from people where Age>21;

(b) Select Name from people where Height>180;

(c) Select Name from people where (Age>21) or (Height>180);

If the SQL queries (a) and (b) above, return 10 rows and 7 rows in the result set respectively, then what is one possible number of rows returned by the SQL query (c) ?

(1) 3 (2) 7 (3) 10 (4) 21

62. The distributed system is a collection of __(P)__ and communication is achieved in distributed system by ___(Q)___, where (P) and (Q) are :

(1) Loosely coupled hardware on tightly coupled software and disk sharing, respectively.

(2) Tightly coupled hardware on loosely coupled software and shared memory, respectively.

(3) Tightly coupled software on loosely coupled hardware and message passing, respectively.

(4) Loosely coupled software on tightly coupled hardware and file sharing, respectively.

63. Consider the following three tables R, S and T. In this question, all the join operations are natural joins (⋈). (π) is the projection operation of a relation :

R	
A	B
1	2
3	2
5	6
7	8
9	8

S	
B	C
6	2
2	4
8	1
8	3
2	5

T	
A	C
7	1
1	2
9	3
5	4
3	5

Possible answer tables for this question are also given as below :

A	B	C
1	2	4
1	2	5
3	2	4
3	2	5
5	6	2
7	8	1
7	8	3
9	8	1
9	8	3

(a)

A	B	C
1	2	2
3	2	5
5	6	4
7	8	1
9	8	3

(b)

A	B	C
1	6	2
3	2	5
5	2	4
7	8	1
9	8	3

(c)

A	B	C
3	2	5
7	8	1
9	8	3

(d)

What is the resulting table of $\pi_{A,B}(R \bowtie T) \bowtie \pi_{B,C}(S \bowtie T)$?

(1) (a) (2) (b) (3) (c) (4) (d)

64. Consider the two class classification task that consists of the following points :
Class C_1 : $[-1, -1]$, $[-1, 1]$, $[1, -1]$
Class C_2 : $[1, 1]$
The decision boundary between the two classes C_1 and C_2 using single perceptron is given by :

(1) $x_1 - x_2 - 0.5 = 0$ (2) $-x_1 + x_2 - 0.5 = 0$
(3) $0.5(x_1 + x_2) - 1.5 = 0$ (4) $x_1 + x_2 - 0.5 = 0$

65. Consider a standard additive model consisting of rules of the form of
If x is A_i AND y is B_i THEN z is C_i.
Given crisp inputs $x = x_0$, $y = y_0$, the output of the model is :

(1) $z = \sum_i \mu_{A_i}(x_0)\, \mu_{B_i}(y_0)\, \mu_{C_i}(z)$

(2) $z = \sum_i \mu_{A_i}(x_0)\, \mu_{B_i}(y_0)$

(3) $z = \text{centroid}\left(\sum_i \mu_{A_i}(x_0)\, \mu_{B_i}(y_0)\, \mu_{C_i}(z)\right)$

(4) $z = \text{centroid}\left(\sum_i \mu_{A_i}(x_0)\, \mu_{B_i}(y_0)\right)$

66. A bell-shaped membership function is specified by three parameters (a, b, c) as follows :

(1) $\dfrac{1}{1 + \left(\dfrac{x - c}{a}\right)^b}$ (2) $\dfrac{1}{1 + \left(\dfrac{x - c}{a}\right)^{2b}}$ (3) $1 + \left(\dfrac{x - c}{a}\right)^b$ (4) $1 - \left(\dfrac{x - c}{a}\right)^{2b}$

67. Which of the following is/are the principle components of a memory-tube display ?
(a) Flooding gun (b) Collector
(c) Phosphorus grains (d) Ground
Codes :
(1) (a) and (b) (2) (c) only (3) (d) only (4) All the above

68. Which of the following steps is/are not required for analog to digital conversion ?
(a) Sensing (b) Conversion (c) Amplification
(d) Conditioning (e) Quantization
Codes :
(1) (a) and (b) (2) (c) and (d)
(3) (a), (b) and (e) (4) None of the above

69. Which raster locations would be chosen by Bresenham's algorithm when scan converting a line from (1, 1) to (8, 5) ?

(1)

x	y
1	1
2	2
3	3
4	3
5	4
6	4
7	5
8	6

(2)

x	y
1	1
2	2
3	2
4	3
5	4
6	5
7	6
8	7

(3)

x	y
1	1
2	2
3	2
4	3
5	3
6	4
7	4
8	5

(4)

x	y
1	1
2	2
3	2
4	3
5	5
6	4
7	5
8	5

70. Consider a unit square centred at origin. The coordinates of the square are translated by a factor $\left(\frac{1}{2}, 1\right)$ and rotated by an angle of 90°. What shall be the coordinates of the new square ?

(1) $\left(\frac{-1}{2}, 0\right), \left(\frac{-1}{2}, 1\right), \left(\frac{-3}{2}, 1\right), \left(\frac{-3}{2}, 0\right)$

(2) $\left(\frac{-1}{2}, 0\right), \left(\frac{1}{2}, 1\right), \left(\frac{3}{2}, 1\right), \left(\frac{3}{2}, 0\right)$

(3) $\left(\frac{-1}{2}, 0\right), \left(\frac{1}{2}, 0\right), \left(\frac{-3}{2}, 1\right), \left(\frac{-3}{2}, 0\right)$

(4) $\left(\frac{-1}{2}, 0\right), \left(\frac{1}{2}, 1\right), \left(\frac{-3}{2}, 1\right), \left(\frac{-3}{2}, 0\right)$

71. Which of the following is/are the components of a CRT ?

(a) Electron Gun

(b) Control Electrode

(c) Focusing Electrode

(d) Phosphor Coated Screen

Codes :

(1) (a) and (d)

(2) (a), (b) and (d)

(3) (a), (b), (c) and (d)

(4) (a), (c) and (d)

72. Which one of the following statements is **incorrect** ?

(1) Pareto analysis is a statistical method used for analyzing causes, and is one of the primary tools for quality management.

(2) Reliability of a software specifies the probability of failure-free operation of that software for a given time duration.

(3) The reliability of a system can also be specified as the Mean Time To Failure (MTTF).

(4) In white-box testing, the test cases are decided from the specifications or the requirements.

73. Consider a language A defined over the alphabet $\Sigma = \{0, 1\}$ as $A = \left\{0^{\lfloor n/2 \rfloor}\ 1^n : n >= 0\right\}$.

The expression $\lfloor n/2 \rfloor$ means the floor of $n/2$, or what you get by rounding $n/2$ down to the nearest integer.

Which of the following is **not** an example of a string in A ?

(1) 011 (2) 0111 (3) 0011 (4) 001111

74. Which one of the following statements, related to the requirements phase in Software Engineering, is **incorrect** ?

(1) "Requirement validation" is one of the activities in the requirements phase.

(2) "Prototyping" is one of the methods for requirement analysis.

(3) "Modelling-oriented approach" is one of the methods for specifying the functional specifications.

(4) "Function points" is one of the most commonly used size metric for requirements.

75. _____ tag is an extension to HTML that can enclose any number of Javascript statements.

(1) <SCRIPT> (2) <BODY> (3) <HEAD> (4) <TITLE>

- o 0 o -

Space For Rough Work