PAPER-III
COMPUTER SCIENCE

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)

Roll No._____
(In words)

D 8 7 1 4

Time : **2 ½** 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 OMR Sheet Number should be entered on this Test Booklet.
4. Each item 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.
   Example : Ⓐ Ⓑ ● Ⓓ
   where (C) 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 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 test question booklet and 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 is 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 उसके कवर पेज 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 अर्थात् 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 OMR पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें ।
4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (A), (B), (C) तथा (D) दिये गये हैं । आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है ।
   उदाहरण : Ⓐ Ⓑ ● Ⓓ
   जबकि (C) 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 चिह्नांकित 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 प्रश्न-पुस्तिका एवं 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 ।**

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

1. 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 n.sec. (B) 110 n.sec.
(C) 75 n.sec. (D) 82.5 n.sec.

2. For switching from a CPU user mode to the supervisor mode following type of interrupt is most appropriate

(A) Internal interrupts (B) External interrupts
(C) Software interrupts (D) None of the above

3. In a dot matrix printer the time to print a character is 6 m.sec., time to space in between characters is 2 m.sec., and the number of characters in a line are 200. The printing speed of the dot matrix printer in characters per second and the time to print a character line are given by which of the following options ?

(A) 125 chars/second and 0.8 seconds
(B) 250 chars/second and 0.6 seconds
(C) 166 chars/second and 0.8 seconds
(D) 250 chars/second and 0.4 seconds

4. Match the following 8085 instructions with the flags :

List – I		**List – II**
a.	XCHG	i. only carry flag is affected.
b.	SUB	ii. no flags are affected.
c.	STC	iii. all flags other than carry flag are affected.
d.	DCR	iv. all flags are affected.

Codes :

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

5. How many times will the following loop be executed ?

```
    LXI B, 0007 H
LOP : DCX B
      MOV A, B
      ORA C
      JNZ LOP
```

(A) 05 (B) 07

(C) 09 (D) 00

6. Specify the contents of the accumulator and the status of the S, Z and CY flags when 8085 microprocessor performs addition of 87 H and 79 H.

(A) 11, 1, 1, 1 (B) 10, 0, 1, 0

(C) 01, 1, 0, 0 (D) 00, 0, 1, 1

7. Location transparency allows :

I. Users to treat the data as if it is done at one location.

II. Programmers to treat the data as if it is at one location.

III. Managers to treat the data as if it is at one location.

Which one of the following is correct ?

(A) I, II and III (B) I and II only

(C) II and III only (D) II only

8. Which of the following is correct ?

I. Two phase locking is an optimistic protocol.

II. Two phase locking is pessimistic protocol

III. Time stamping is an optimistic protocol.

IV. Time stamping is pessimistic protocol.

(A) I and III (B) II and IV

(C) I and IV (D) II and III

9. _____ rules used to limit the volume of log information that has to be handled and processed in the event of system failure involving the loss of volatile information.

(A) Write-ahead log (B) Check-pointing

(C) Log buffer (D) Thomas

10. Let R = ABCDE is a relational scheme with functional dependency set F = {A → B, B → C, AC → D}. The attribute closures of A and E are

(A) ABCD, ϕ (B) ABCD, E

(C) Φ, ϕ (D) ABC, E

11. Consider the following statements :

I. Re-construction operation used in mixed fragmentation satisfies commutative rule.

II. Re-construction operation used in vertical fragmentation satisfies commutative rule

Which of the following is correct ?

(A) I

(B) II

(C) Both are correct

(D) None of the statements are correct.

12. Which of the following is false ?

(A) Every binary relation is never be in BCNF.

(B) Every BCNF relation is in 3NF.

(C) 1 NF, 2 NF, 3 NF and BCNF are based on functional dependencies.

(D) Multivalued Dependency (MVD) is a special case of Join Dependency (JD).

13. Which of the following categories of languages do not refer to animation languages ?

(A) Graphical languages (B) General-purpose languages

(C) Linear-list notations (D) None of the above

14. Match the following :

List – I	**List – II**
a. Tablet, Joystick	i. Continuous devices
b. Light Pen, Touch Screen	ii. Direct devices
c. Locator, Keyboard	iii. Logical devices
d. Data Globe, Sonic Pen	iv. 3D interaction devices

Codes :

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

15. A technique used to approximate halftones without reducing spatial resolution is known as _____.

(A) Halftoning (B) Dithering

(C) Error diffusion (D) None of the above

16. Consider a triangle represented by A(0, 0), B(1, 1), C(5, 2). The triangle is rotated by 45 degrees about a point P(–1, –1). The co-ordinates of the new triangle obtained after rotation shall be _____

(A) $A'(-1, \sqrt{2}-1), B'(-1, 2\sqrt{2}-1), C'\left(\frac{3}{2}\sqrt{2}-1, \frac{9}{2}\sqrt{2}-1\right)$

(B) $A'(\sqrt{2}-1, -1), B'(2\sqrt{2}-1, -1), C'\left(\frac{3}{2}\sqrt{2}-1, \frac{9}{2}\sqrt{2}-1\right)$

(C) $A'(-1, \sqrt{2}-1), B'(2\sqrt{2}-1, -1), C'\left(\frac{3}{2}\sqrt{2}-1, \frac{9}{2}\sqrt{2}-1\right)$

(D) $A'(-1, \sqrt{2}-1), B'(2\sqrt{2}-1, -1), C'\left(\frac{9}{2}\sqrt{2}-1, \frac{3}{2}\sqrt{2}-1\right)$

17. In Cyrus-Beck algorithm for line clipping the value of t parameter is computed by the relation :
(Here P_1 and P_2 are the two end points of the line, f is a point on the boundary, n_1 is inner normal)

(A) $\frac{(P_1 - f_i) \cdot n_i}{(P_2 - P_1) \cdot n_i}$ (B) $\frac{(f_i - P_1) \cdot n_i}{(P_2 - P_1) \cdot n_i}$

(C) $\frac{(P_2 - f_i) \cdot n_i}{(P_1 - P_2) \cdot n_i}$ (D) $\frac{(f_i - P_2) \cdot n_i}{(P_1 - P_2) \cdot n_i}$

18. Match the following :

a. Cavalier Projection	i. The direction of projection is chosen so that there is no foreshortening of lines perpendicular to the *xy* plane.
b. Cabinet Projection	ii. The direction of projection is chosen so that lines perpendicular to the *xy* planes are foreshortened by half their lengths.
c. Isometric Projection	iii. The direction of projection makes equal angles with all of the principal axis.
d. Orthographic Projection	iv. Projections are characterized by the fact that the direction of projection is perpendicular to the view plane.

Codes :

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

19. Consider the following statements S1, S2 and S3 :

S1 : In call-by-value, anything that is passed into a function call is unchanged in the caller's scope when the function returns.

S2 : In call-by-reference, a function receives implicit reference to a variable used as argument.

S3 : In call-by-reference, caller is unable to see the modified variable used as argument.

(A) S3 and S2 are true. (B) S3 and S1 are true.

(C) S2 and S1 are true. (D) S1, S2, S3 are true.

20. How many tokens will be generated by the scanner for the following statement ?

$x = x * (a + b) - 5;$

(A) 12 (B) 11

(C) 10 (D) 07

21. Which of the following statements is not true ?

(A) MPI_Isend and MPI_Irecv are non-blocking message passing routines of MPI.

(B) MPI_Issend and MPI_Ibsend are non-blocking message passing routines of MPI.

(C) MPI_Send and MPI_Recv are non-blocking message passing routines of MPI.

(D) MPI_Ssend and MPI_Bsend are blocking message passing routines of MPI.

22. The pushdown automation $M = (\{q_0, q_1, q_2\}, \{a, b\}, \{0, 1\}, \delta, q_0, 0, \{q_0\})$ with

$\delta(q_0, a, 0) = \{(q_1, 10)\}$

$\delta(q_1, a, 1) = \{(q_1, 11)\}$

$\delta(q_1, b, 1) = \{(q_2, \lambda)\}$

$\delta(q_2, b, 1) = \{(q_2, \lambda)\}$

$\delta(q_2, \lambda, 0) = \{(q_0, \lambda)\}$

Accepts the language

(A) $L = \{a^n b^m \mid n, m \geq 0\}$ (B) $L = \{a^n b^n \mid n \geq 0\}$

(C) $L = \{a^n b^m \mid n, m > 0\}$ (D) $L = \{a^n b^n \mid n > 0\}$

23. Given two languages :

$L_1 = \{(ab)^n a^k \mid n > k, k \geq 0\}$

$L_2 = \{a^n b^m \mid n \neq m\}$

Using pumping lemma for regular language, it can be shown that

(A) L_1 is regular and L_2 is not regular.

(B) L_1 is not regular and L_2 is regular.

(C) L_1 is regular and L_2 is regular.

(D) L_1 is not regular and L_2 is not regular.

24. Regular expression for the complement of language $L = \{a^n b^m \mid n \geq 4, m \leq 3\}$ is

(A) $(a + b)^* ba(a + b)^*$

(B) $a^* bbbbb^*$

(C) $(\lambda + a + aa + aaa)b^* + (a + b)^* ba(a + b)^*$

(D) None of the above

25. For n devices in a network, _____ number of duplex-mode links are required for a mesh topology.

(A) n(n + 1) (B) n (n – 1)
(C) n(n + 1)/2 (D) n(n – 1)/2

26. How many characters per second (7 bits + 1 parity) can be transmitted over a 3200 bps line if the transfer is asynchronous ? (Assuming 1 start bit and 1 stop bit)

(A) 300 (B) 320
(C) 360 (D) 400

27. Which of the following is not a field in TCP header ?

(A) Sequence number (B) Fragment offset
(C) Checksum (D) Window size

28. What is the propagation time if the distance between the two points is 48,000 ? Assume the propagation speed to be 2.4×10^8 metre/second in cable.

(A) 0.5 ms (B) 20 ms
(C) 50 ms (D) 200 ms

29. _____ is a bit-oriented protocol for communication over point-to-point and multipoint links.

(A) Stop-and-wait (B) HDLC
(C) Sliding window (D) Go-back-N

30. Which one of the following is true for asymmetric-key cryptography ?

(A) Private key is kept by the receiver and public key is announced to the public.
(B) Public key is kept by the receiver and private key is announced to the public.
(C) Both private key and public key are kept by the receiver.
(D) Both private key and public key are announced to the public.

31. Any decision tree that sorts n elements has height

(A) $\Omega(n)$ (B) $\Omega(l\text{gn})$
(C) $\Omega(nl\text{gn})$ (D) $\Omega(n^2)$

32. Match the following :

List – I	**List – II**
a. Bucket sort	i. $O(n^3 l\text{gn})$
b. Matrix chain multiplication	ii. $O(n^3)$
c. Huffman codes	iii. $O(nl\text{gn})$
d. All pairs shortest paths	iv. $O(n)$

Codes :

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

33. We can show that the clique problem is NP-hard by proving that
(A) CLIQUE ≤ P 3-CNF_SAT
(B) CLIQUE ≤ P VERTEX_COVER
(C) CLIQUE ≤ P SUBSET_SUM
(D) None of the above

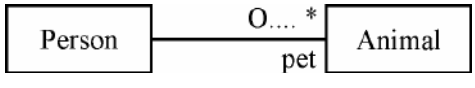
34. Dijkstra algorithm, which solves the single-source shortest--paths problem, is a _____, and the Floyd-Warshall algorithm, which finds shortest paths between all pairs of vertices, is a _____
(A) Greedy algorithm, Divide-conquer algorithm
(B) Divide-conquer algorithm, Greedy algorithm
(C) Greedy algorithm, Dynamic programming algorithm
(D) Dynamic programming algorithm, Greedy algorithm

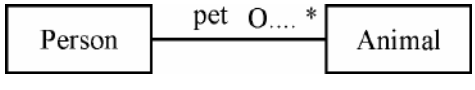
35. Consider the problem of a chain $<A_1, A_2, A_3>$ of three matrices. Suppose that the dimensions of the matrices are 10×100, 100×5 and 5×50 respectively. There are two different ways of parenthesization : (i) $((A_1 A_2)A_3)$ and (ii) $(A_1(A_2 A_3))$. Computing the product according to the first parenthesization is _____ times faster in comparison to the second parenthesization.
(A) 5 (B) 10
(C) 20 (D) 100

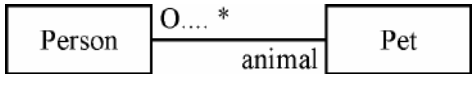
36. Suppose that we have numbers between 1 and 1000 in a binary search tree and we want to search for the number 365. Which of the following sequences could not be the sequence of nodes examined ?
(A) 4, 254, 403, 400, 332, 346, 399, 365
(B) 926, 222, 913, 246, 900, 260, 364, 365
(C) 927, 204,913, 242, 914, 247, 365
(D) 4, 401, 389, 221, 268, 384, 383, 280, 365

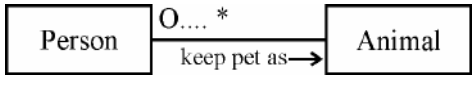
37. Which methods are utilized to control the access to an object in multi-threaded programming ?
(A) Asynchronized methods (B) Synchronized methods
(C) Serialized methods (D) None of the above

38. How to express that some person keeps animals as pets ?

(A) 

(B) 

(C) 

(D) 

39. Converting a primitive type data into its corresponding wrapper class object instance is called

(A) Boxing (B) Wrapping
(C) Instantiation (D) Autoboxing

40. The behaviour of the document elements in XML can be defined by

(A) Using document object
(B) Registering appropriate event handlers
(C) Using element object
(D) All of the above

41. What is true about UML stereotypes ?

(A) Stereotype is used for extending the UML language.
(B) Stereotyped class must be abstract
(C) The stereotype indicates that the UML element cannot be changed
(D) UML profiles can be stereotyped for backward compatibility

42. Which method is called first by an applet program ?

(A) start( ) (B) run( )
(C) init( ) (D) begin( )

43. Which one of the following is not a source code metric ?

(A) Halstead metric (B) Function point metric
(C) Complexity metric (D) Length metric

44. To compute function points (FP), the following relationship is used
FP = Count – total × (0.65 + 0.01 × Σ(F_i)) where F_i (i = 1 to n) are value adjustment factors (VAF) based on n questions. The value of n is

(A) 12 (B) 14
(C) 16 (D) 18

45. Assume that the software team defines a project risk with 80% probability of occurrence of risk in the following manner :
Only 70 percent of the software components scheduled for reuse will be integrated into the application and the remaining functionality will have to be custom developed. If 60 reusable components were planned with average component size as 100 LOC and software engineering cost for each LOC as $ 14, then the risk exposure would be

(A) $ 25,200 (B) $ 20,160
(C) $ 17,640 (D) $ 15,120

46. Maximum possible value of reliability is

(A) 100 (B) 10
(C) 1 (D) 0

47. 'FAN IN' of a component A is defined as

(A) Count of the number of components that can call, or pass control, to a component A
(B) Number of components related to component A
(C) Number of components dependent on component A
(D) None of the above

48. Temporal cohesion means
(A) Coincidental cohesion
(B) Cohesion between temporary variables
(C) Cohesion between local variables
(D) Cohesion with respect to time

49. Various storage devices used by an operating system can be arranged as follows in increasing order of accessing speed :
(A) Magnetic tapes → magnetic disks → optical disks → electronic disks → main memory → cache → registers
(B) Magnetic tapes → magnetic disks → electronic disks → optical disks → main memory → cache → registers
(C) Magnetic tapes → electronic disks → magnetic disks → optical disks → main memory → cache → registers
(D) Magnetic tapes → optical disks → magnetic disks → electronic disks → main memory → cache → registers

50. How many disk blocks are required to keep list of free disk blocks in a 16 GB hard disk with 1 kB block size using linked list of free disk blocks ? Assume that the disk block number is stored in 32 bits.
(A) 1024 blocks
(B) 16794 blocks
(C) 20000 blocks
(D) 1048576 blocks

51. Consider an imaginary disk with 40 cylinders. A request come to read a block on cylinder 11. While the seek to cylinder 11 is in progress, new requests come in for cylinders 1, 36, 16, 34, 9 and 12 in that order. The number of arm motions using shortest seek first algorithm is
(A) 111
(B) 112
(C) 60
(D) 61

52. An operating system has 13 tape drives. There are three processes P1, P2 & P3. Maximum requirement of P1 is 11 tape drives, P2 is 5 tape drives and P3 is 8 tape drives. Currently, P1 is allocated 6 tape drives, P2 is allocated 3 tape drives and P3 is allocated 2 tape drives. Which of the following sequences represent a safe state ?
(A) P2 P1 P3
(B) P2 P3 P1
(C) P1 P2 P3
(D) P1 P3 P2

53. Monitor is an Interprocess Communication (IPC) technique which can be described as
(A) It is higher level synchronization primitive and is a collection of procedures, variables, and data structures grouped together in a special package.
(B) It is a non-negative integer which apart from initialization can be acted upon by wait and signal operations.
(C) It uses two primitives, send and receive which are system calls rather than language constructs.
(D) It consists of the IPC primitives implemented as system calls to block the process when they are not allowed to enter critical region to save CPU time.

54. In a distributed computing environment, distributed shared memory is used which is

(A) Logical combination of virtual memories on the nodes.

(B) Logical combination of physical memories on the nodes.

(C) Logical combination of the secondary memories on all the nodes.

(D) All of the above

55. Equivalent logical expression for the Well Formed Formula (WFF),

$\sim(\forall x)\ F[x]$

is

(A) $\forall x\ (\sim F[x])$ (B) $\sim(\exists x)\ F[x]$

(C) $\exists x\ (\sim F[x])$ (D) $\forall x\ F[x]$

56. An A* algorithm is a heuristic search technique which

(A) is like a depth-first search where most promising child is selected for expansion

(B) generates all successor nodes and computes an estimate of distance (cost) from start node to a goal node through each of the successors. It then chooses the successor with shortest cost.

(C) saves all path lengths (costs) from start node to all generated nodes and chooses shortest path for further expansion.

(D) none of the above

57. The resolvent of the set of clauses

$(A \vee B, \sim A \vee D, C \vee \sim B)$ is

(A) $A \vee B$ (B) $C \vee D$

(C) $A \vee C$ (D) $A \vee D$

58. Match the following :

a. Script	i. Directed graph with labelled nodes for graphical representation of knowledge
b. Conceptual Dependencies	ii. Knowledge about objects and events is stored in record-like structures consisting of slots and slot values.
c. Frames	iii. Primitive concepts and rules to represent natural language statements
d. Associative Network	iv. Frame like structures used to represent stereotypical patterns for commonly occurring events in terms of actors, roles, props and scenes

Codes :

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

59. Match the following components of an expert system :

a.	I/O interface	i.	Accepts user's queries and responds to question through I/O interface
b.	Explanation module	ii.	Contains facts and rules about the domain
c.	Inference engine	iii.	Gives the user, the ability to follow inferencing steps at any time during consultation
d.	Knowledge base	iv.	Permits the user to communicate with the system in a natural way

Codes :

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

60. A computer based information system is needed :

I. as it is difficult for administrative staff to process data.

II. due to rapid growth of information and communication technology.

III. due to growing size of organizations which need to process large volume of data.

IV. as timely and accurate decisions are to be taken.

Which of the above statement(s) is/are true ?

(A) I and II

(B) III and IV

(C) II and III

(D) II and IV

61. Given the recursively enumerable language (L_{RE}), the context sensitive language (L_{CS}), the recursive language (L_{REC}), the context free language (L_{CF}) and deterministic context free language (L_{DCF}). The relationship between these families is given by

(A) $L_{CF} \subseteq L_{DCF} \subseteq L_{CS} \subseteq L_{RE} \subseteq L_{REC}$

(B) $L_{CF} \subseteq L_{DCF} \subseteq L_{CS} \subseteq L_{REC} \subseteq L_{RE}$

(C) $L_{DCF} \subseteq L_{CF} \subseteq L_{CS} \subseteq L_{RE} \subseteq L_{REC}$

(D) $L_{DCF} \subseteq L_{CF} \subseteq L_{CS} \subseteq L_{REC} \subseteq L_{RE}$

62. Match the following :

List – I	List – II
a. Context free grammar	i. Linear bounded automaton
b. Regular grammar	ii. Pushdown automaton
c. Context sensitive grammar	iii. Turing machine
d. Unrestricted grammar	iv. Deterministic finite automaton

Codes :

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

63. According to pumping lemma for context free languages :
Let L be an infinite context free language, then there exists some positive integer m such that any $w \in L$ with $|w| \geq m$ can be decomposed as $w = u\ v\ x\ y\ z$

(A) with $|vxy| \leq m$ such that $uv^i xy^i z \in L$ for all $i = 0, 1, 2$

(B) with $|vxy| \leq m$, and $|vy| \geq 1$, such that $uv^i xy^i z \in L$ for all $i = 0, 1, 2, \ldots\ldots$

(C) with $|vxy| \geq m$, and $|vy| \leq 1$, such that $uv^i xy^i z \in L$ for all $i = 0, 1, 2, \ldots\ldots$

(D) with $|vxy| \geq m$, and $|vy| \geq 1$, such that $uv^i xy^i z \in L$ for all $i = 0, 1, 2, \ldots\ldots$

64. Given two spatial masks

$$S_1 = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 0 \\ 0 & 1 & 0 \end{bmatrix} \text{ and } S_2 = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

The Laplacian of an image at all points (x, y) can be implemented by convolving the image with spatial mask. Which of the following can be used as the spatial mask ?

(A) only S_1 (B) only S_2

(C) Both S_1 and S_2 (D) None of these

65. Given a simple image of size 10×10 whose histogram models the symbol probabilities and is given by

p_1	p_2	p_3	p_4
a	b	c	d

The first order estimate of image entropy is maximum when

(A) $a = 0, b = 0, c = 0, d = 1$ (B) $a = \frac{1}{2}, b = \frac{1}{2}, c = 0, d = 0$

(C) $a = \frac{1}{3}, b = \frac{1}{3}, c = \frac{1}{3}, d = 0$ (D) $a = \frac{1}{4}, b = \frac{1}{4}, c = \frac{1}{4}, d = \frac{1}{4}$

66. A Butterworth lowpass filter of order n, with a cutoff frequency at distance D_0 from the origin, has the transfer function H(u, v) given by

(A) $\dfrac{1}{1+\left[\dfrac{D(u,v)}{D_0}\right]^{2n}}$ (B) $\dfrac{1}{1+\left[\dfrac{D(u,v)}{D_0}\right]^{n}}$

(C) $\dfrac{1}{1+\left[\dfrac{D_0}{D(u,v)}\right]^{2n}}$ (D) $\dfrac{1}{1+\left[\dfrac{D_0}{D(u,v)}\right]^{n}}$

67. If an artificial variable is present in the 'basic variable' column of optimal simplex table, then the solution is

(A) Optimum (B) Infeasible

(C) Unbounded (D) Degenerate

68. The occurrence of degeneracy while solving a transportation problem means that

(A) total supply equals total demand

(B) total supply does not equal total demand

(C) the solution so obtained is not feasible

(D) none of these

69. Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and is given in the following table :

		Jobs				
		I	II	III	IV	V
Men	P	2	9	2	7	1
	Q	6	8	7	6	1
	R	4	6	5	3	1
	S	4	2	7	3	1
	T	5	3	9	5	1

Find out the minimum time required to complete all the jobs.

(A) 5 (B) 11

(C) 13 (D) 15

70. Consider the following statements about a perception :

I. Feature detector can be any function of the input parameters.

II. Learning procedure only adjusts the connection weights to the output layer.

Identify the correct statement out of the following :

(A) I is false and II is false. (B) I is true and II is false.

(C) I is false and II is true. (D) I is true and II is true.

71. A _____ point of a fuzzy set A is a point $x \in X$ at which $\mu_A(x) = 0.5$

(A) core (B) support

(C) crossover (D) α-cut

72. Match the following learning modes w.r.t. characteristics of available information for learning :

a.	Supervised	i.	Instructive information on desired responses, explicitly specified by a teacher.
b.	Recording	ii.	A priori design information for memory storing
c.	Reinforcement	iii.	Partial information about desired responses, or only "right" or "wrong" evaluative information
d.	Unsupervised	iv.	No information about desired responses

Codes :

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

73. Which of the following versions of Windows O.S. contain built-in partition manager which allows us to shrink and expand pre-defined drives ?

(A) Windows Vista (B) Windows 2000

(C) Windows NT (D) Windows 98

74. A Trojan horse is

(A) A program that performs a legitimate function that is known to an operating system or its user and also has a hidden component that can be used for nefarious purposes like attacks on message security or impersonation.

(B) A piece of code that can attach itself to other programs in the system and spread to other systems when programs are copied or transferred.

(C) A program that spreads to other computer systems by exploiting security holes like weaknesses in facilities for creation of remote processes

(D) All of the above

75. Which of the following computing models is not an example of distributed computing environment ?

(A) Cloud computing (B) Parallel computing

(C) Cluster computing (D) Peer-to-peer computing

Space For Rough Work