

**PAPER-III**  
**COMPUTER SCIENCE AND APPLICATIONS**

**Signature and Name of Invigilator**

1. (Signature) \_\_\_\_\_

(Name) \_\_\_\_\_

2. (Signature) \_\_\_\_\_

(Name) \_\_\_\_\_

**J 8 7 1 3**

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

Roll No. 

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(In figures as per admission card)

Roll No. \_\_\_\_\_  
(In words)

Time : 2 1/2 hours]

[Maximum Marks : 150

Number of Pages in this Booklet : 12

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 / polythene bag on the booklet. Do not accept a booklet without sticker-seal / without polythene bag 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 :** (A) (B) (C) (D)  
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, 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 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. पहले 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 / पॉलिथीन बैग को फाड़ लें । खुली हुई या बिना स्टीकर-सील / बिना पॉलिथीन बैग 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 :** (A) (B) (C) (D) 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, 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 । हालाँकि आप परीक्षा समाप्ति पर OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं ।
10. केवल नीले/काले बाल प्वाइंट 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 अंक काटे नहीं जाएँगे ।

**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. The candidates are required to select the most appropriate answer of each question.

1. The Software Maturity Index (SMI) is defined as

$$SMI = [M_f - (F_a + F_c + F_d)] / M_f$$

Where

$M_f$  = the number of modules in the current release.

$F_a$  = the number of modules in the current release that have been added.

$F_c$  = the number of modules in the current release that have been changed.

$F_d$  = the number of modules in the current release that have been deleted.

The product begins to stabilize when

- (A) SMI approaches 1
- (B) SMI approaches 0
- (C) SMI approaches -1
- (D) None of the above

2. Match the following :

- |                                     |                       |
|-------------------------------------|-----------------------|
| a. Watson-Felix model               | i. Failure intensity  |
| b. Quick-Fix model                  | ii. Cost estimation   |
| c. Putnam resource allocation model | iii. Project planning |
| d. Logarithmic-Poisson Model        | iv. Maintenance       |

**Codes :**

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

3. \_\_\_\_\_ is a process model that removes defects before they can precipitate serious hazards.

- (A) Incremental model
- (B) Spiral model
- (C) Cleanroom software engineering
- (D) Agile model

4. Equivalence partitioning is a \_\_\_\_\_ method that divides the input domain of a program into classes of data from which test cases can be derived.

- (A) White-box testing
- (B) Black-box testing
- (C) Orthogonal array testing
- (D) Stress testing

5. The following three golden rules :

- (i) Place the user in control
- (ii) Reduce the user's memory load
- (iii) Make the interface consistent are for

- (A) User satisfaction
- (B) Good interface design
- (C) Saving system's resources
- (D) None of these

6. Software safety is a \_\_\_\_\_ activity that focuses on the identification and assessment of potential hazards that may affect software negatively and cause an entire system to fail.

- (A) Risk mitigation, monitoring and management
- (B) Software quality assurance
- (C) Software cost estimation
- (D) Defect removal efficiency

7. The "PROJECT" operator of a relational algebra creates a new table that has always
- More columns than columns in original table
  - More rows than original table
  - Same number of rows as the original table
  - Same number of columns as the original table
8. The employee information of an Organization is stored in the relation : Employee (name, sex, salary, deptname)  
Consider the following SQL query  
Select deptname from Employee  
Where sex = 'M'  
group by deptname  
having avg (salary) > {select avg (salary) from Employee}  
Output of the given query corresponds to
- Average salary of employee more than average salary of the organization.
  - Average salary less than average salary of the organization.
  - Average salary of employee equal to average salary of the organization.
  - Average salary of male employees in a department is more than average salary of the organization.
9. For a database relation R(a, b, c, d) where the domains of a, b, c, d include only the atomic values. The functional dependency  $a \rightarrow c, b \rightarrow d$  holds in the following relation
- In 1NF not in 2NF
  - In 2NF not in 3NF
  - In 3NF
  - In 1NF

10. Match the following :
- |           |                             |
|-----------|-----------------------------|
| a. RAID 0 | i. Bit interleaved parity   |
| b. RAID 1 | ii. Non redundant stripping |
| c. RAID 2 | iii. Mirrored disks         |
| d. RAID 3 | iv. Error correcting codes  |

**Codes :**

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

11. The golden ratio  $\phi$  and its conjugate  $\bar{\phi}$  both satisfy the equation
- $x^3 - x - 1 = 0$
  - $x^3 + x - 1 = 0$
  - $x^2 - x - 1 = 0$
  - $x^2 + x - 1 = 0$
12. The solution of recurrence relation,  $T(n) = 2T(\text{floor}(\sqrt{n})) + \log n$  is
- $O(n \log \log \log n)$
  - $O(n \log \log n)$
  - $O(\log \log n)$
  - $O(\log n \log \log n)$
13. In any n-element heap, the number of nodes of height h is
- less than equal to  $\left\lceil \frac{n}{2^h} \right\rceil$
  - greater than  $\left\lceil \frac{n}{2^h} \right\rceil$
  - greater than  $\left\lceil \frac{n}{2^{h+1}} \right\rceil$
  - less than equal to  $\left\lceil \frac{n}{2^{h+1}} \right\rceil$

14. A data file of 1,00,000 characters contains only the characters g-l, with the frequencies as indicated in table :

	g	h	i	j	k	l
<b>Frequency in thousand</b>	45	13	12	16	9	5

using the variable-length code by Huffman codes, the file can be encoded with

- (A) 2,52,000 bits  
 (B) 2,64,000 bits  
 (C) 2,46,000 bits  
 (D) 2,24,000 bits
15. A vertex cover of an undirected graph  $G(V, E)$  is a subset  $V_1 \subseteq V$  vertices such that
- (A) Each pair of vertices in  $V_1$  is connected by an edge  
 (B) If  $(u, v) \in E$  then  $u \in V_1$  and  $v \in V_1$   
 (C) If  $(u, v) \in E$  then  $u \in V_1$  or  $v \in V_1$   
 (D) All pairs of vertices in  $V_1$  are not connected by an edge
16. In a fully connected mesh network with  $n$  devices, there are \_\_\_\_\_ physical channels to link all devices.
- (A)  $n(n-1)/2$       (B)  $n(n+1)/2$   
 (C)  $2n$               (D)  $2n+1$
17. The baud rate of a signal is 600 baud/second. If each signal unit carries 6 bits, then the bit rate of a signal is \_\_\_\_\_.
- (A) 3600  
 (B) 100  
 (C) 6/600  
 (D) None of the above

18. Match the following :

- |                      |                           |
|----------------------|---------------------------|
| a. Data link layer   | i. Flow control           |
| b. Network layer     | ii. Node to node delivery |
| c. Transport layer   | iii. Mail services        |
| d. Application layer | iv. Routing               |

**Codes :**

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

19. An image is 1024\*800 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 10-Mbps Ethernet ?
- (A) 196.6 seconds  
 (B) 19.66 seconds  
 (C) 1.966 seconds  
 (D) 0.1966 seconds
20. The \_\_\_\_\_ measures the relative strengths of two signals or a signal at two different points.
- (A) frequency  
 (B) attenuation  
 (C) throughput  
 (D) decibel
21. Which one of the following media is multidrop ?
- (A) Shielded Twisted pair cable  
 (B) Unshielded Twisted pair cable  
 (C) Thick Coaxial cable  
 (D) Fiber Optic cable

22. What is the baud rate of the standard 10 Mbps Ethernet ?  
 (A) 10 megabaud (B) 20 megabaud  
 (C) 30 megabaud (D) 40 megabaud

23. At any iteration of simplex method, if  $\Delta_j (Z_j - C_j)$  corresponding to any non-basic variable  $X_j$  is obtained as zero, the solution under the test is  
 (A) Degenerate solution  
 (B) Unbounded solution  
 (C) Alternative solution  
 (D) Optimal solution

24. A basic feasible solution to a m-origin, n-destination transportation problem is said to be \_\_\_\_\_ if the number of positive allocations are less than  $m + n - 1$ .  
 (A) degenerate  
 (B) non-degenerate  
 (C) unbounded  
 (D) unbalanced

25. The total transportation cost in an initial basic feasible solution to the following transportation problem using Vogel's Approximation method is

	W1	W2	W3	W4	W5	Supply
F1	4	2	3	2	6	8
F2	5	4	5	2	1	12
F3	6	5	4	7	3	14
Demand	4	4	6	8	8	

- (A) 76 (B) 80  
 (C) 90 (D) 96

26. An actor in an animation is a small program invoked \_\_\_\_\_ per frame to determine the characteristics of some object in the animation.  
 (A) once (B) twice  
 (C) 30 times (D) 60 times

27. Bresenham line drawing algorithm is attractive because it uses  
 (A) Real arithmetic only  
 (B) Integer arithmetic only  
 (C) Floating point arithmetic  
 (D) Real and integer arithmetic

28. The refresh rate above which a picture stops flickering and fuses into a steady image is called \_\_\_\_\_.  
 (A) Crucial fusion frequency  
 (B) Current frequency fusion  
 (C) Critical fusion frequency  
 (D) Critically diffused frequency

29. In homogenous coordinate system (x, y, z) the points with  $z = 0$  are called  
 (A) Cartesian points  
 (B) Parallel points  
 (C) Origin point  
 (D) Point at infinity

30. If 40 black lines interleaved with 40 white lines can be distinguished across one inch, the resolution is  
 (A) 40 line-pairs per inch  
 (B) 80 line-pairs per inch  
 (C) 1600 lines per inch  
 (D) 40 lines per inch

31. Images tend to be very large collection of data. The size of memory required for a 1024 by 1024 image in which the colour of each pixel is represented by a n-bit number, (in an 8 bit machines) is  
 (A)  $n \times 8$  MB  
 (B)  $n / 8$  MB  
 (C)  $(1024 \times 1024) / 8$  MB  
 (D) 1024 MB

32. Arrays in C language can have \_\_\_\_\_ with reference to memory representation.

- (A) n-subscripts
- (B) two-subscripts
- (C) only one subscript
- (D) three subscripts only

33. Refer the points as listed below :

- (a) What are the operator precedence rules ?
- (b) What are the operator associativity rules ?
- (c) What is the order of operand evaluation ?
- (d) Are there restrictions on operand evaluation side effects ?

Which of the above must be considered as primary design issues for arithmetic expressions ?

- (A) (a), (b) and (c)
- (B) (a), (c) and (d)
- (C) (a), (b) and (d)
- (D) (a), (b), (c) and (d)

34. Horn clauses are special kinds of propositions which can be described as

- (A) Single atomic proposition on left side.
- (B) Single or multiple atomic proposition on left side.
- (C) A single atomic proposition on left side and a single atomic proposition on right side.
- (D) A single atomic proposition on left side or an empty left side.

35. Which of the following is/are the fundamental semantic model(s) of parameter passing ?

- (A) in mode
- (B) out mode
- (C) in-out mode
- (D) all of the above

36. The grammar with production rules

$$S \rightarrow aSb \mid SS \mid \lambda$$

generates language L given by :

- (A)  $L = \{w \in \{a, b\}^* \mid n_a(w) = n_b(w) \text{ and } n_a(v) \geq n_b(v) \text{ where } v \text{ is any prefix of } w\}$
- (B)  $L = \{w \in \{a, b\}^* \mid n_a(w) = n_b(w) \text{ and } n_a(v) \leq n_b(v) \text{ where } v \text{ is any prefix of } w\}$
- (C)  $L = \{w \in \{a, b\}^* \mid n_a(w) \neq n_b(w) \text{ and } n_a(v) \geq n_b(v) \text{ where } v \text{ is any prefix of } w\}$
- (D)  $L = \{w \in \{a, b\}^* \mid n_a(w) \neq n_b(w) \text{ and } n_a(v) \leq n_b(v) \text{ where } v \text{ is any prefix of } w\}$

37. A pushdown automation  $M = (Q, \Sigma, \Gamma, \delta, q_0, z, F)$  is set to be deterministic subject to which of the following condition(s), for every  $q \in Q, a \in \Sigma \cup \{\lambda\}$  and  $b \in \Gamma$

(s1)  $\delta(q, a, b)$  contains at most one element

(s2) if  $\delta(q, \lambda, b)$  is not empty then  $\delta(q, c, b)$  must be empty for every  $c \in \Sigma$

- (A) only s1
- (B) only s2
- (C) both s1 and s2
- (D) neither s1 nor s2

38. For every context free grammar (G) there exists an algorithm that passes any  $w \in L(G)$  in number of steps proportional to

- (A)  $\ln|w|$  (B)  $|w|$   
 (C)  $|w|^2$  (D)  $|w|^3$

39. Match the following :

- |                               |                                    |
|-------------------------------|------------------------------------|
| a. Context sensitive language | i. Deterministic finite automation |
| b. Regular grammar            | ii. Recursive enumerable           |
| c. Context free grammar       | iii. Recursive language            |
| d. Unrestricted grammar       | iv. Pushdown automation            |

**Codes :**

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

40. The statements s1 and s2 are given as :

s1 : Context sensitive languages are closed under intersection, concatenation, substitution and inverse homomorphism.

s2 : Context free languages are closed under complementation, substitution and homomorphism.

Which of the following is correct statement ?

- (A) Both s1 and s2 are correct.  
 (B) s1 is correct and s2 is not correct.  
 (C) s1 is not correct and s2 is correct.  
 (D) Both s1 and s2 are not correct.

41. Which one of the following is not an addressing mode ?

- (A) Register indirect  
 (B) Autoincrement  
 (C) Relative indexed  
 (D) Immediate operand

42. Computers can have instruction formats with

- (A) only two address and three address instructions  
 (B) only one address and two address instructions  
 (C) only one address, two address and three address instructions  
 (D) zero address, one address, two address and three address instructions

43. Which is not a typical program control instruction ?

- (A) BR (B) JMP  
 (C) SHL (D) TST

44. Interrupt which arises from illegal or erroneous use of an instruction or data is

- (A) Software interrupt  
 (B) Internal interrupt  
 (C) External interrupt  
 (D) All of the above

45. The simplified function in product of sums of Boolean function  $F(W, X, Y, Z) = \Sigma(0, 1, 2, 5, 8, 9, 10)$  is

- (A)  $(W' + X')(Y' + Z')(X' + Z)$   
 (B)  $(W' + X')(Y' + Z')(X' + Z')$   
 (C)  $(W' + X')(Y' + Z)(X' + Z)$   
 (D)  $(W' + X')(Y + Z')(X' + Z)$

46. Match the following :
- |         |  |
|---------|--|
| a. TTL  | i. High component density                  |
| b. ECL  | ii. Low power consumption                  |
| c. MOS  | iii. Evolution of “diode-transistor-logic” |
| d. CMOS | iv. High speed digital circuits            |

**Codes :**

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

47. Match the following :
- |                               |                           |
|-------------------------------|---------------------------|
| a. Foreign keys               | i. Domain constraint      |
| b. Private key                | ii. Referential integrity |
| c. Event control action model | iii. Encryption           |
| d. Data security              | iv. Trigger               |

**Codes :**

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

48. When an array is passed as a parameter to a function which of the following statements is correct ?
- (A) The function can change values in the original array.
- (B) The function cannot change values in the original array.
- (C) Results in compilation error.
- (D) Results in runtime error.

49. Suppose you want to delete the name that occurs before “Vivek” in an alphabetical listing. Which of the following data structures shall be most efficient for this operation ?

- (A) Circular linked list
- (B) Doubly linked list
- (C) Linked list
- (D) Dequeue

50. What will be the output of the following segment of the program ?

```
main( )
{
    char *s = “hello world”;
    int i = 7;
    printf(“%, *s”, i, s);
}
```

- (A) Syntax error
- (B) hello w
- (C) hello
- (D) o world

51. Trace the error :

```
void main( )
{
    int *b, &a;
    *b = 20
    printf(“%d, %d”, a, *b)
}
```

- (A) No error
- (B) Logical error
- (C) Syntax error
- (D) Semantic error



52. Match the following :
- |              |   |
|--------------|---|
| a. calloc()  | i. Frees previously allocated space     |
| b. free()    | ii. Modifies previously allocated space |
| c. malloc()  | iii. Allocates space for array          |
| d. realloc() | iv. Allocates requested size of space   |

**Codes :**

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

53. Binary symmetric channel uses  
 (A) Half duplex protocol  
 (B) Full duplex protocol  
 (C) Bit oriented protocol  
 (D) None of the above
54. Hamming distance between 100101000110 and 110111101101 is  
 (A) 3 (B) 4  
 (C) 5 (D) 6
55. Given code word 1110001010 is to be transmitted with even parity check bit. The encoded word to be transmitted for this code is  
 (A) 11100010101 (B) 11100010100  
 (C) 1110001010 (D) 111000101
56. The number of distinct binary images which can be generated from a given binary image of right  $M \times N$  are  
 (A)  $M + N$  (B)  $M \times N$   
 (C)  $2^{M+N}$  (D)  $2^{MN}$
57. If  $f(x, y)$  is a digital image, then  $x, y$  and amplitude values of  $f$  are  
 (A) Finite  
 (B) Infinite  
 (C) Neither finite nor infinite  
 (D) None of the above

58. Consider the following processes with time slice of 4 milliseconds (I/O requests are ignored) :

Process	A	B	C	D
Arrival time	0	1	2	3
CPU cycle	8	4	9	5

The average turn around time of these processes will be

- (A) 19.25 milliseconds  
 (B) 18.25 milliseconds  
 (C) 19.5 milliseconds  
 (D) 18.5 milliseconds

59. A job has four pages A, B, C, D and the main memory has two page frames only. The job needs to process its pages in following order :

ABACABDBACD

Assuming that a page interrupt occurs when a new page is brought in the main memory, irrespective of whether the page is swapped out or not. The number of page interrupts in FIFO and LRU page replacement algorithms are

- (A) 9 and 7 (B) 7 and 6  
 (C) 9 and 8 (D) 8 and 6

60. Suppose S and Q are two semaphores initialized to 1. P1 and P2 are two processes which are sharing resources.

**P1 has statements P2 has statements**

wait(S) ;	wait(Q) ;
wait(Q) ;	wait(S) ;
critical-section 1;	critical-section 2;
signal(S) ;	signal(Q) ;
signal(Q) ;	signal(S) ;

Their execution may sometimes lead to an undesirable situation called

- (A) Starvation  
 (B) Race condition  
 (C) Multithreading  
 (D) Deadlock

61. An operating system using banker's algorithm for deadlock avoidance has ten dedicated devices (of same type) and has three processes P1, P2 and P3 with maximum resource requirements of 4, 5 and 8 respectively. There are two states of allocation of devices as follows :

State 1	Processes	P1	P2	P3
	Devices allocated	2	3	4

State 2	Processes	P1	P2	P3
	Devices allocated	0	2	4

Which of the following is correct ?

- (A) State 1 is unsafe and state 2 is safe.  
 (B) State 1 is safe and state 2 is unsafe.  
 (C) Both, state 1 and state 2 are safe.  
 (D) Both, state 1 and state 2 are unsafe.
62. Let the time taken to switch between user mode and kernel mode of execution be T1 while time taken to switch between two user processes be T2. Which of the following is correct ?
- (A)  $T1 < T2$   
 (B)  $T1 > T2$   
 (C)  $T1 = T2$   
 (D) Nothing can be said about the relation between T1 and T2.
63. Working set model is used in memory management to implement the concept of
- (A) Swapping  
 (B) Principle of Locality  
 (C) Segmentation  
 (D) Thrashing

64. A UNIX file system has 1 KB block size and 4-byte disk addresses. What is the maximum file size if the inode contains ten direct block entries, one single indirect block entry, one double indirect block entry and one triple indirect block entry ?

- (A) 30 GB            (B) 64 GB  
 (C) 16 GB            (D) 1 GB

65. A thread is usually defined as a light weight process because an Operating System (OS) maintains smaller data structure for a thread than for a process. In relation to this, which of the following statement is correct ?

- (A) OS maintains only scheduling and accounting information for each thread.  
 (B) OS maintains only CPU registers for each thread.  
 (C) OS does not maintain a separate stack for each thread.  
 (D) OS does not maintain virtual memory state for each thread.

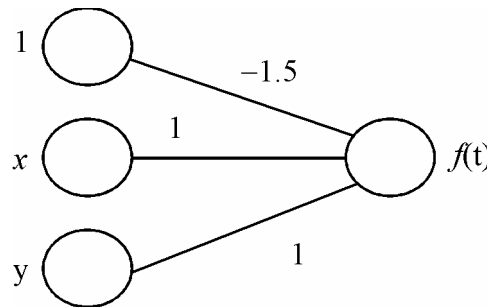
66. The versions of windows operating system like windows XP and window Vista uses following file system :

- (A) FAT-16  
 (B) FAT-32  
 (C) NTFS (NT File System)  
 (D) All of the above

67. Which one of the following is a correct implementation of the meta-predicate "not" in PROLOG (Here G represents a goal) ?

- (A)  $\text{not}(G):- \text{!, call}(G), \text{fail. not}(G).$   
 (B)  $\text{not}(G):- \text{call}(G), \text{!, fail. not}(G).$   
 (C)  $\text{not}(G):- \text{call}(G), \text{fail, !. not}(G).$   
 (D)  $\text{not}(G):- \text{call}(G), \text{fail. not}(G):- \text{!}.$

68. Which one of the following is not an informed search technique ?  
 (A) Hill climbing search  
 (B) Best first search  
 (C) A\* search  
 (D) Depth first search
69. If we convert  
 $\exists u \forall v \forall x \exists y (P(f(u),v, x, y) \rightarrow Q(u,v,y))$  to  
 $\forall v \forall x (P(f(a),v, x, g(v,x)) \rightarrow Q(a,v,g(v,x)))$   
 This process is known as  
 (A) Simplification  
 (B) Unification  
 (C) Skolemization  
 (D) Resolution
70. Given two jugs of capacities 5 litres and 3 litres with no measuring markers on them. Assume that there is endless supply of water. Then the minimum number of states to measure 4 litres water will be  
 (A) 3 (B) 4  
 (C) 5 (D) 7
71. The map colouring problem can be solved using which of the following technique ?  
 (A) Means-end analysis  
 (B) Constraint satisfaction  
 (C) AO\* search  
 (D) Breadth first search
72. Which of the following is a knowledge representation technique used to represent knowledge about stereotype situation ?  
 (A) Semantic network  
 (B) Frames  
 (C) Scripts  
 (D) Conceptual Dependency

73. A fuzzy set A on R is \_\_\_\_\_ iff  
 $A(\lambda x_1 + (1 - \lambda)x_2) \geq \min [A(x_1), A(x_2)]$   
 for all  $x_1, x_2 \in R$  and all  $\lambda \in [0, 1]$ , where min denotes the minimum operator.  
 (A) Support (B)  $\alpha$ -cut  
 (C) Convex (D) Concave
74. If A and B are two fuzzy sets with membership functions  
 $\mu_A(x) = \{0.6, 0.5, 0.1, 0.7, 0.8\}$   
 $\mu_B(x) = \{0.9, 0.2, 0.6, 0.8, 0.5\}$   
 Then the value of  $\mu_{\overline{A \cup B}}(x)$  will be  
 (A)  $\{0.9, 0.5, 0.6, 0.8, 0.8\}$   
 (B)  $\{0.6, 0.2, 0.1, 0.7, 0.5\}$   
 (C)  $\{0.1, 0.5, 0.4, 0.2, 0.2\}$   
 (D)  $\{0.1, 0.5, 0.4, 0.2, 0.3\}$
75. Consider a single perception with weights as given in the following figure :
- 
- and  $f(t)$  defined as  
 $f(t) = \begin{cases} 1, & t > 0 \\ 0, & t \leq 0 \end{cases}$   
 The above perception can solve  
 (A) OR problem  
 (B) AND problem  
 (C) XOR problem  
 (D) All of the above

**Space For Rough Work**