

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

**Signature and Name of Invigilator**

1. (Signature) \_\_\_\_\_  
(Name) \_\_\_\_\_
2. (Signature) \_\_\_\_\_  
(Name) \_\_\_\_\_

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

All questions are compulsory.

1. Which of the following is a correct predicate logic statement for “Every Natural number has one successor” ?  
(A)  $\forall x \exists y (\text{succ}(x, y) \wedge (\exists z \text{ succ}(x, z) \Rightarrow \text{equal}(y, z)))$   
(B)  $\forall x \exists y (\text{succ}(x, y) \vee (\exists z \text{ succ}(x, z) \Rightarrow \text{equal}(y, z)))$   
(C)  $\exists y \forall x (\text{succ}(x, y) \wedge (\exists z \text{ succ}(x, z) \Rightarrow \text{equal}(y, z)))$   
(D)  $\forall x \exists y \text{ succ}(x, y)$
2.  $\alpha - \beta$  cutoffs are applied to \_\_\_\_\_  
(A) Depth first search  
(B) Best first search  
(C) Minimax search  
(D) Breadth first search
3. Assume that each alphabet can have a value between 0 to 9 in a cryptoarithmic problem  
$$\begin{array}{r} \text{CROSS} \\ + \text{ROADS} \\ \hline \text{DANGER} \end{array}$$
  
Which of the following statement is true ?  
(i) No two alphabets can have the same numeric value.  
(ii) Any two alphabets may have the same numeric value.  
(iii)  $D = 0$   
(iv)  $D = 1$   
(A) (i) and (iii)    (B) (i) and (iv)  
(C) (ii) and (iii)    (D) (ii) and (iv)
4. Which of the following is not a part of an expert system shell ?  
(A) Knowledge Base  
(B) Inference Engine  
(C) Explanation Facility  
(D) None of the above
5. The Blocks World Problem in Artificial Intelligence is normally discussed to explain a \_\_\_\_\_  
(A) Search technique  
(B) Planning system  
(C) Constraint satisfaction system  
(D) Knowledge base system
6. Means-Ends Analysis process centres around the detection of difference between the current state and the goal state. Once such a difference is found, then to reduce the difference one applies \_\_\_\_\_  
(A) a forward search that can reduce the difference.  
(B) a backward search that can reduce the difference.  
(C) a bidirectional search that can reduce the difference.  
(D) an operator that can reduce the difference.
7. Suppose a file of 10,000 characters is to be sent over a line at 2400 bps. Assume that the data is sent in frames. Each frame consists of 1000 characters and an overhead of 48 bits per frame. Using synchronous transmission, the total overhead time is \_\_\_\_\_.  
(A) 0.05 second    (B) 0.1 second  
(C) 0.2 second    (D) 2.0 second
8. Which of the following is the size of Network bits and Host bits of Class A of IP address ?  
(A) Network bits 7, Host bits 24  
(B) Network bits 14, Host bits 16  
(C) Network bits 15, Host bits 16  
(D) Network bits 16, Host bits 16

9. Which of the following field of the TCP header tells how many bytes may be sent starting at the byte acknowledged ?  
 (A) TCP header length  
 (B) Window size  
 (C) Acknowledgement number  
 (D) Urgent pointer
10. Which of the following is a bit rate of an 8-PSK signal having 2500 Hz bandwidth ?  
 (A) 2500 bps (B) 5000 bps  
 (C) 7500 bps (D) 20000 bps
11. Match the following :
- |          |   |
|----------|---|
| (a) UDP  | (i) Message Transfer Protocol           |
| (b) OSPF | (ii) Bit-oriented Protocol              |
| (c) SMTP | (iii) Interior Gateway Routing Protocol |
| (d) HDLC | (iv) Connectionless Transport Protocol  |
- Codes :**
- |           |       |      |      |
|-----------|-------|------|------|
| (a)       | (b)   | (c)  | (d)  |
| (A) (iii) | (iv)  | (ii) | (i)  |
| (B) (iv)  | (iii) | (ii) | (i)  |
| (C) (iv)  | (iii) | (i)  | (ii) |
| (D) (iii) | (iv)  | (i)  | (ii) |
12. Given the IP address 201.14.78.65 and the subnet mask 255.255.255.224. What is the subnet address ?  
 (A) 201.14.78.32 (B) 201.14.78.64  
 (C) 201.14.78.65 (D) 201.14.78.224
13. If an artificial variable is present in the 'basic variable' of optimal simplex table then the solution is \_\_\_\_\_  
 (A) Alternative solution  
 (B) Infeasible solution  
 (C) Unbounded solution  
 (D) Degenerate solution

14. An optimal assignment requires that the minimum number of horizontal and vertical lines that can be drawn to cover all zeros be equal to the number of  
 (A) rows or columns  
 (B) rows + columns  
 (C) rows + columns – 1  
 (D) rows + columns + 1

15. Which of the following is the minimum cost for an assignment problem given below ?

|         |     | Jobs |   |   |   |
|---------|-----|------|---|---|---|
|         |     | A    | B | C | D |
| Workers | I   | 5    | 3 | 2 | 8 |
|         | II  | 7    | 9 | 2 | 6 |
|         | III | 6    | 4 | 5 | 7 |
|         | IV  | 5    | 7 | 7 | 8 |

- (A) 13 (B) 16  
 (C) 17 (D) 18

16. Assume, L is regular language. Let statements  $S_1$  and  $S_2$  be defined as :  
 $S_1$  :  $\text{SQRT}(L) = \{ x \mid \text{for some } y \text{ with } |y| = |x|^2, xy \in L \}$ .  
 $S_2$  :  $\text{LOG}(L) = \{ x \mid \text{for some } y \text{ with } |y| = 2^{|x|}, xy \in L \}$ .  
 Which of the following is true ?  
 (A)  $S_1$  is correct and  $S_2$  is not correct.  
 (B) Both  $S_1$  and  $S_2$  are correct.  
 (C) Both  $S_1$  and  $S_2$  are not correct.  
 (D)  $S_1$  is not correct and  $S_2$  is correct.

17. A regular grammar for the language  $L = \{ a^n b^m \mid n \text{ is even and } m \text{ is even} \}$  is given by  
 (A)  $S \rightarrow aSb \mid S_1; S_1 \rightarrow bS_1a \mid \lambda$   
 (B)  $S \rightarrow aaS \mid S_1; S_1 \rightarrow bSb \mid \lambda$   
 (C)  $S \rightarrow aSb \mid S_1; S_1 \rightarrow S_1ab \mid \lambda$   
 (D)  $S \rightarrow aaS \mid S_1; S_1 \rightarrow bbS_1 \mid \lambda$

18. Given the following productions of a grammar :

$$\begin{aligned} S &\rightarrow aA \mid aBB; \\ A &\rightarrow aaA \mid \lambda; \\ B &\rightarrow bB \mid bbC; \\ C &\rightarrow B \end{aligned}$$

Which of the following is true ?

- (A) The language corresponding to the given grammar is a set of even number of a's.
- (B) The language corresponding to the given grammar is a set of odd number of a's.
- (C) The language corresponding to the given grammar is a set of even number of a's followed by odd number of b's.
- (D) The language corresponding to the given grammar is a set of odd number of a's followed by even number of b's.

19. The language accepted by the non-deterministic pushdown automaton

$$M = (\{q_0, q_1, q_2\}, \{a, b\}, \{a, b, z\}, \delta, q_0, z, \{q_2\})$$

$$\delta(q_0, a, z) = \{(q_1, a), (q_2, \lambda)\};$$

$$\delta(q_1, b, a) = \{(q_1, b)\}$$

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

is

- (A)  $L(abb^*a)$
- (B)  $\{a\} \cup L(abb^*a)$
- (C)  $L(ab^*a)$
- (D)  $\{a\} \cup L(ab^*a)$

20. The language  $L = \{a^n b^n a^m b^m \mid n \geq 0, m \geq 0\}$  is

- (A) Context free but not linear
- (B) Context free and linear
- (C) Not Context free and not linear
- (D) Not Context free but linear

21. Assume statements  $S_1$  and  $S_2$  defined as :

$S_1$  :  $L_2 - L_1$  is recursive enumerable where  $L_1$  and  $L_2$  are recursive and recursive enumerable respectively.

$S_2$  : The set of all Turing machines is countable.

Which of the following is true ?

- (A)  $S_1$  is correct and  $S_2$  is not correct.
- (B) Both  $S_1$  and  $S_2$  are correct.
- (C) Both  $S_1$  and  $S_2$  are not correct.
- (D)  $S_1$  is not correct and  $S_2$  is correct.

22. Non-deterministic pushdown automaton that accepts the language generated by the grammar:  $S \rightarrow aSS \mid ab$  is

(A)  $\delta(q_0, \lambda, z) = \{(q_1, z)\};$

$$\delta(q_0, a, S) = \{(q_1, SS)\}, (q_1, B) \}$$

$$\delta(q_0, b, B) = \{(q_1, \lambda)\},$$

$$\delta(q_1, \lambda, z) = \{(q_f, \lambda)\}$$

(B)  $\delta(q_0, \lambda, z) = \{(q_1, Sz)\};$

$$\delta(q_0, a, S) = \{(q_1, SS)\}, (q_1, B) \}$$

$$\delta(q_0, b, B) = \{(q_1, \lambda)\},$$

$$\delta(q_1, \lambda, z) = \{(q_f, \lambda)\}$$

(C)  $\delta(q_0, \lambda, z) = \{(q_1, Sz)\};$

$$\delta(q_0, a, S) = \{(q_1, S)\}, (q_1, B) \}$$

$$\delta(q_0, b, \lambda) = \{(q_1, B)\},$$

$$\delta(q_1, \lambda, z) = \{(q_f, \lambda)\}$$

(D)  $\delta(q_0, \lambda, z) = \{(q_1, z)\};$

$$\delta(q_0, a, S) = \{(q_1, SS)\}, (q_1, B) \}$$

$$\delta(q_0, b, \lambda) = \{(q_1, B)\},$$

$$\delta(q_1, \lambda, z) = \{(q_f, \lambda)\}$$

23. Match the following :
- |                         |                               |
|-------------------------|-------------------------------|
| (a) Dangling pointer    | (i) Buffer replacement policy |
| (b) Page fault          | (ii) Variable-length records  |
| (c) List representation | (iii) Object identifier       |
| (d) Toss-immediate      | (iv) Pointer-swizzling        |

**Codes :**

- |     |       |       |      |      |
|-----|-------|-------|------|------|
|     | (a)   | (b)   | (c)  | (d)  |
| (A) | (iii) | (iv)  | (ii) | (i)  |
| (B) | (iv)  | (iii) | (ii) | (i)  |
| (C) | (iv)  | (iii) | (i)  | (ii) |
| (D) | (iii) | (iv)  | (i)  | (ii) |
24. \_\_\_\_\_ constraints ensure that a value that appears in one relation for a given set of attributes also appears for a certain set of attributes in another relation.
- (A) Logical Integrity  
 (B) Referential Integrity  
 (C) Domain Integrity  
 (D) Data Integrity
25. The SQL expression  
 Select distinct T, branch\_name from  
 branch T, branch S  
 where T.assets>S.assets and  
 S.branch\_city="Mumbai" finds the  
 names of
- (A) All branches that have greater assets than some branch located in Mumbai.  
 (B) All branches that have greater assets than all branches in Mumbai.  
 (C) The branch that has greatest asset in Mumbai.  
 (D) Any branch that has greater assets than any branch in Mumbai.

26. Let A be the set of comfortable houses given as

$$A = \left\{ \frac{x_1}{0.8}, \frac{x_2}{0.9}, \frac{x_3}{0.1}, \frac{x_4}{0.7} \right\}$$

and B be the set of affordable houses

$$B = \left\{ \frac{x_1}{0.9}, \frac{x_2}{0.8}, \frac{x_3}{0.6}, \frac{x_4}{0.2} \right\}$$

Then the set of comfortable and affordable houses is

(A)  $\left\{ \frac{x_1}{0.8}, \frac{x_2}{0.8}, \frac{x_3}{0.1}, \frac{x_4}{0.2} \right\}$

(B)  $\left\{ \frac{x_1}{0.9}, \frac{x_2}{0.9}, \frac{x_3}{0.6}, \frac{x_4}{0.7} \right\}$

(C)  $\left\{ \frac{x_1}{0.8}, \frac{x_2}{0.8}, \frac{x_3}{0.6}, \frac{x_4}{0.7} \right\}$

(D)  $\left\{ \frac{x_1}{0.7}, \frac{x_2}{0.7}, \frac{x_3}{0.7}, \frac{x_4}{0.9} \right\}$

27. Support of a fuzzy set

$$A = \left\{ \frac{x_1}{0.2}, \frac{x_2}{0.15}, \frac{x_3}{0.9}, \frac{x_4}{0.95}, \frac{x_5}{0.15} \right\}$$

within a universal set X is given as

(A)  $\left\{ \frac{x_1}{0.15}, \frac{x_2}{0.15}, \frac{x_3}{0.15}, \frac{x_4}{0.15}, \frac{x_5}{0.15} \right\}$

(B)  $\left\{ \frac{x_1}{0.95}, \frac{x_2}{0.95}, \frac{x_3}{0.95}, \frac{x_4}{0.95}, \frac{x_5}{0.95} \right\}$

(C)  $\{x_3, x_4\}$

(D)  $\{x_1, x_2, x_3, x_4, x_5\}$

28. In a single perceptron, the updation rule of weight vector is given by

(A)  $w(n+1) = w(n) + \eta[d(n) - y(n)]$

(B)  $w(n+1) = w(n) - \eta[d(n) - y(n)]$

(C)  $w(n+1) = w(n) + \eta[d(n) - y(n)] * x(n)$

(D)  $w(n+1) = w(n) - \eta[d(n) - y(n)] * x(n)$

29. \_\_\_\_\_ refers to the discrepancy among a computed, observed or measured value and the true specified or theoretically correct values.

(A) Fault (B) Failure

(C) Defect (D) Error

30. Which logic family dissipates the minimum power ?  
 (A) DTL (B) TTL  
 (C) ECL (D) CMOS
31. Which of the following electronic component is not found in IC's ?  
 (A) Diode (B) Resistor  
 (C) Transistor (D) Inductor
32. A given memory chip has 14 address pins and 8 data pins. It has the following number of locations.  
 (A)  $2^8$  (B)  $2^{14}$   
 (C)  $2^6$  (D)  $2^{12}$
33. The instruction: MOV CL, [BX] [DI] + 8 represents the \_\_\_\_\_ addressing mode.  
 (A) Based Relative  
 (B) Based Indexed  
 (C) Indexed Relative  
 (D) Register Indexed
34. The power dissipation of a flip-flop is 3 mW. The power dissipation of a digital system with 4 flip-flops is given by  
 (A)  $3^4$  mW (B)  $4^3$  mW  
 (C)  $4/3$  mW (D) 12 mW
35. An astable multivibrator using the 555 timer to generate a square wave of 5 KHz with 70% duty cycle will have  
 (A)  $R_A = 40.4 \text{ K}\Omega$ ,  $R_B = 17.25 \text{ K}\Omega$ ,  
 $C = 2000 \text{ pF}$   
 (B)  $R_A = 17.25 \text{ K}\Omega$ ,  $R_B = 40.4 \text{ K}\Omega$ ,  
 $C = 2000 \text{ pF}$   
 (C)  $R_A = 40.4 \text{ K}\Omega$ ,  $R_B = 17.25 \text{ K}\Omega$ ,  
 $C = 5000 \text{ pF}$   
 (D)  $R_A = 17.25 \text{ K}\Omega$ ,  $R_B = 40.4 \text{ K}\Omega$ ,  
 $C = 5000 \text{ pF}$
36. A binary ripple counter is required to count up to 16383. How many flip-flops are required ?  
 (A) 16382 (B) 8191  
 (C) 512 (D) 14
37. The time complexity of recurrence relation  
 $T(n) = T(n/3) + T(2n/3) + O(n)$  is  
 (A)  $O(\lg n)$  (B)  $O(n)$   
 (C)  $O(n \lg n)$  (D)  $O(n^2)$
38. How many people must there be in a room before there is a 50% chance that two of them were born on the same day of the year ?  
 (A) At least 23 (B) At least 183  
 (C) At least 366 (D) At least 730
39. The number of possible parenthesizations of a sequence of n matrices is  
 (A)  $O(n)$   
 (B)  $\theta(n \lg n)$   
 (C)  $\Omega(2^n)$   
 (D) None of the above
40. The time complexity of an efficient algorithm to find the longest monotonically increasing subsequence of n numbers is  
 (A)  $O(n)$   
 (B)  $O(n \lg n)$   
 (C)  $O(n^2)$   
 (D) None of the above
41. Given a binary search trees for a set of n=5 keys with the following probabilities :

|       |      |      |      |      |      |      |
|-------|------|------|------|------|------|------|
| i     | 0    | 1    | 2    | 3    | 4    | 5    |
| $p_i$ | -    | 0.15 | 0.10 | 0.05 | 0.10 | 0.20 |
| $q_i$ | 0.05 | 0.10 | 0.05 | 0.05 | 0.05 | 0.10 |

The expected optimal cost of the search is

- (A) 2.65 (B) 2.70  
 (C) 2.75 (D) 2.80

42. Given 0-1 knapsack problem and fractional knapsack problem and the following statements :
- $S_1$  : 0-1 knapsack is efficiently solved using Greedy algorithm.
- $S_2$  : Fractional knapsack is efficiently solved using Dynamic programming.
- Which of the following is true ?
- (A)  $S_1$  is correct and  $S_2$  is not correct.  
 (B) Both  $S_1$  and  $S_2$  are correct.  
 (C) Both  $S_1$  and  $S_2$  are not correct.  
 (D)  $S_1$  is not correct and  $S_2$  is correct.
43. Equivalence class partitioning approach is used to divide the input domain into a set of equivalence classes, so that if a program works correctly for a value, then it will work correctly for all the other values in that class. This is used \_\_\_\_\_.
- (A) to partition the program in the form of classes.  
 (B) to reduce the number of test cases required.  
 (C) for designing test cases in white box testing.  
 (D) all of the above.
44. The failure intensity for a basic model as a function of failures experienced is given as  $\lambda(\mu) = \lambda_0 [1 - (\mu)/(V_0)]$  where  $\lambda_0$  is the initial failure intensity at the start of the execution,  $\mu$  is the average or expected number of failures at a given point in time, the quantity  $V_0$  is the total number of failures that would occur in infinite time. Assume that a program will experience 100 failures in infinite time, the initial failure intensity was 10 failures/CPU hr. Then the decrement of failures intensity per failure will be
- (A) 10 per CPU hr.  
 (B) 0.1 per CPU hr.  
 (C) -0.1 per CPU hr.  
 (D) 90 per CPU hr.
45. Improving processing efficiency or performance or restructuring of software to improve changeability is known as
- (A) Corrective maintenance  
 (B) Perfective maintenance  
 (C) Adaptive maintenance  
 (D) Code maintenance
46. In \_\_\_\_\_, modules A and B make use of a common data type, but perhaps perform different operations on it.
- (A) Data coupling  
 (B) Stamp coupling  
 (C) Control coupling  
 (D) Content coupling
47. Consider the following schemas :
- Branch\_Schema = (branch\_name, assets, city)  
 Customer\_Schema = (customer\_name, street, city)  
 Deposit\_Schema = (branch\_name, account\_number, customer\_name, balance)  
 Borrow\_Schema = (branch\_name, loan\_number, customer\_name, amount)
- Which of the following tuple relational calculus finds all customers who have loan amount more than ₹ 12,000 ?
- (A)  $\{t(\text{customer\_name}) \mid t \in \text{borrow}[?] \wedge t[\text{amount}] > 12000\}$   
 (B)  $\{t \mid t(\text{customer\_name}) \mid t \in \text{borrow}[?] \wedge t[\text{amount}] > 12000\}$   
 (C)  $\{t \mid [?] \in \text{borrow} \wedge (t(\text{customer\_name}) = s(\text{customer\_name})) [?] \wedge [amount] > 12000\}$   
 (D)  $\{t \mid [?] \in \text{borrow} \wedge (t(\text{customer\_name}) [?] \wedge s[amount] > 12000)\}$
48. Match the following :
- |               |                         |
|---------------|-------------------------|
| (a) Create    | (i) The E-R Model       |
| (b) Select    | (ii) Relationship Model |
| (c) Rectangle | (iii) DDL               |
| (d) Record    | (iv) DML                |
- Codes :**
- |           |       |      |      |
|-----------|-------|------|------|
| (a)       | (b)   | (c)  | (d)  |
| (A) (iii) | (iv)  | (i)  | (ii) |
| (B) (iv)  | (iii) | (ii) | (i)  |
| (C) (iv)  | (iii) | (i)  | (ii) |
| (D) (iii) | (iv)  | (ii) | (i)  |

49. Match the following :

- (a)  (i) One to one relationship
- (b)  (ii) Relationship
- (c)  (iii) Many to many relationship
- (d)  (iv) Many to one relationship

**Codes :**

- (a) (b) (c) (d)
- (A) (iii) (iv) (ii) (i)
- (B) (iv) (iii) (ii) (i)
- (C) (ii) (iii) (iv) (i)
- (D) (iii) (iv) (i) (ii)
50. Sixty (60) reusable components were available for an application. If only 70% of these components can be used, rest 30% would have to be developed from scratch. If average component is 100 LOC and cost of each LOC is ₹ 14, what will be the risk exposure if risk probability is 80% ?
- (A) ₹ 25,200 (B) ₹ 20,160
- (C) ₹ 25,160 (D) ₹ 20,400
51. Consider the following two function declarations :
- (i) `int *f()` (ii) `int (*f)()`
- Which of the following is true ?
- (A) Both are identical.
- (B) The first is a correct declaration and the second is wrong.
- (C) Both are different ways of declaring pointer to a function.
- (D) The first declaration is a function returning a pointer to an integer and the second is a pointer to function returning integer.

52. Assume that we have constructor function for both Base and Derived classes. Now consider the declaration :

```
main ()
```

```
Base *p = new Derived;
```

In what sequence, the constructor will be executed ?

- (A) Derived class constructor is followed by Base class constructor.
- (B) Base class constructor is followed by Derived class constructor.
- (C) Base class constructor is never called.
- (D) Derived class constructor is never called.

53. What is the output of the following program ?

```
#include<stdio.h>
main()
{
int a, b = 0;
static int c[10] =
{1, 2, 3, 4, 5, 6, 7, 8, 9, 0};
for (a=0; a<10;++a);
if ((c[a]%2) == 0) b+=c[a];
printf("%d",b);
}
```

- (A) 15 (B) 25
- (C) 45 (D) 20

54. A Program contains the following declarations and initial assignments

```
int i = 8, j = 5;
```

```
double x = 0.005, y = -0.01;
```

```
char c='c', d='d';
```

Determine the value of the following expressions which involve the use of library functions:

```
abs(i-2*j) ; log(exp(x)) ;
```

```
toupper(d)
```

- (A) 2; 0.005; D (B) 1; 0.005; D
- (C) 2; 0.005; E (D) 1; 0.005; e

55. MPEG involves both spatial compression and temporal compression. The spatial compression is similar to JPEG and temporal compression removes \_\_\_\_\_ frames.  
 (A) Temporal (B) Voice  
 (C) Spatial (D) Redundant
56. If the data unit is 111111 and the divisor is 1010. In CRC method, what is the dividend at the transmission before division ?  
 (A) 1111110000 (B) 1111111010  
 (C) 111111000 (D) 111111
57. If user A wants to send an encrypted message to user B. The plain text of A is encrypted with the \_\_\_\_\_.  
 (A) Public Key of user A  
 (B) Public Key of user B  
 (C) Private Key of user A  
 (D) Private Key of user B
58. A \_\_\_\_\_ can forward or block packets based on the information in the network layer and transport layer header.  
 (A) Proxy firewall  
 (B) Firewall  
 (C) Packet filter firewall  
 (D) Message digest firewall
59. Which of the following graphics devices are known as active graphics devices ?  
 (i) Alphanumeric devices  
 (ii) Thumb wheels  
 (iii) Digitizers  
 (iv) Joystics  
 (A) (i) and (ii)  
 (B) (iii) and (iv)  
 (C) (i), (ii) and (iii)  
 (D) (i), (ii), (iii) and (iv)
60. A diametric projection is said to be trimetric projection when  
 (i) two of the three foreshortening factors are equal and third is arbitrary.  
 (ii) all of the three foreshortening factors are equal.  
 (iii) all of the three foreshortening factors are arbitrary.  
 Which of the above is true ?  
 (A) (i) and (ii) (B) (ii) and (iii)  
 (C) (i) only (D) (iii) only
61. Which of the following is/are fundamental method(s) of antialiasing ?  
 (i) Increase of sample rate.  
 (ii) Treating a pixel as a finite area rather than as a point.  
 (iii) Decrease of sample rate.  
 (A) (i) and (ii) (B) (ii) and (iii)  
 (C) (i) only (D) (ii) only
62. The two color systems – the HSV and HLS are  
 (A) Hue, Saturation, Value and Hue, Lightness, Saturation.  
 (B) High, Standard, Value and High, Lightness, Saturation.  
 (C) Highly, Saturated, Value and Highly, Lightened, Saturation.  
 (D) Highly, Standard, Value and Hue, Lightness, Saturation.
63. The parametric representation of the line segment between the position vectors  $P_1(2, 3)$  and  $P_2(5, 4)$  is given as  
 (A)  $x(t) = 2+7t, y(t) = 0 \leq t \leq \frac{3+7t}{3+7t}$   
 (B)  $x(t) = 2+10t, y(t) = 0 \leq t \leq \frac{3+12t}{3+12t}$   
 (C)  $x(t) = 2+3t, y(t) = 3+t, 0 \leq t \leq 1$   
 (D)  $t(x, y) = 14t, 0 \leq t \leq 1$
64. Consider the following transformation matrix for rotation (clockwise) :  

$$[T] = \begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ -\sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$
 This matrix rotates an object by an angle  $\theta$  about :  
 (A) X-axis  
 (B) Y-axis  
 (C) Z-axis  
 (D) All of the above

65. Consider the following sequence of operations :

- (i) Pointer p1 is set to point at a new heap-dynamic variable.
- (ii) Pointer p2 is assigned p1's value.
- (iii) The heap dynamic variable pointed to by p1 is explicitly de-allocated, but p2 is not changed by the operation.

This situation leads to which of the following :

- (A) p1 becomes a dangling pointer
- (B) p2 becomes a dangling pointer
- (C) Both p1 and p2 are now dangling pointers
- (D) Neither p1 nor p2 is now a dangling pointer

66. The programming languages C and C++ are not strongly typed languages because :

- (A) Both C and C++ allow functions for which parameters are not type checked.
- (B) Both C and C++ allow functions for which parameters are type checked.
- (C) Both C and C++ allow functions for which parameters are not type checked and also the union types in these languages are not type checked.
- (D) Union types in these (C and C++) languages are not type checked.

67. The tracing model in Prolog describes program execution in terms of certain events. These events are

- (A) call and exit
- (B) call and fail
- (C) call, exit and redo
- (D) call, exit, redo and fail

68. Which of the following statements is not correct with reference to distributed systems ?

- (A) Distributed system represents a global view of the network and considers it as a virtual uni-processor system by controlling and managing resources across the network on all the sites.
- (B) Distributed system is built on bare machine, not an add-on to the existing software.
- (C) In a distributed system, kernel provides smallest possible set of services on which other services are built. This kernel is called microkernel. Open servers provide other services and access to shared resources.
- (D) In a distributed system, if a user wants to run the program on other nodes or share the resources on remote sites due to their beneficial aspects, user has to log on to that site.

69. A system contains 10 units of resource of same type. The resource requirement and current allocation of these resources for three processes P, Q and R are as follows :

|                     | P | Q | R |
|---------------------|---|---|---|
| Maximum requirement | 8 | 7 | 5 |
| Current allocation  | 4 | 1 | 3 |

Now, consider the following resource requests :

- (i) P makes a request for 2 resource units.
  - (ii) Q makes request for 2 resources units.
  - (iii) R makes a request of 2 resource units.
- For a safe state, which of the following options must be satisfied ?
- (A) Only request (i)
  - (B) Only request (ii)
  - (C) Only request (iii)
  - (D) Request (i) and (ii)

70. Consider the following set of processes with the length of CPU burst time in milliseconds (ms) :

| Process    | A | B | C | D | E |
|------------|---|---|---|---|---|
| Burst time | 6 | 1 | 2 | 1 | 5 |
| Priority   | 3 | 1 | 3 | 4 | 2 |

Assume that processes are stored in ready queue in following order :

A – B – C – D – E

Using round robin scheduling with time slice of 1 ms, the average turn around time is

- (A) 8.4 ms
- (B) 12.4 ms
- (C) 9.2 ms
- (D) 9.4 ms

71. Consider a main memory with 3 page frames for the following page reference string :  
5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 4, 1, 4  
Assuming that the execution of process is initiated after loading page 5 in memory, the number of page faults in FIFO and second chance replacement respectively are  
(A) 8 and 9 (B) 10 and 11  
(C) 7 and 9 (D) 9 and 8
72. Which of the following shell scripts will produce the output "my first script" ?  
(A) for i in my first script { echo -i \$i }  
(B) for my first script; do echo -n; done  
(C) for i in my first script; do echo -i \$i; done  
(D) for n in my first script; do echo -i \$i; done
73. The portion of Windows 2000 operating system which is not portable is  
(A) processor management  
(B) user interface  
(C) device management  
(D) virtual memory management
74. Match the following for Windows Operating System :
- |                                 |  |
|---------------------------------|--|
| (a) Hard-ware abstraction layer | (i) Starting all processes, emulation of different operating systems, security functions, transform character based applications to graphical representation.    |
| (b) Kernel                      | (ii) Export a virtual memory interface, support for symmetric multiprocessing, administration, details of mapping memory, configuring I/O buses, setting up DMA. |
| (c) Executive                   | (iii) Thread scheduling, interrupt and exception handling, recovery after power failure.   |
| (d) Win32 sub-system            | (iv) Object manager, virtual memory manager, process manager, plug-and-play and power manager.   |

**Codes :**

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

75. Which of the following statements is not true for UNIX Operating System ?

- (A) Major strength of UNIX Operating System is its open standards which enabled large number of organizations ranging from academia to industries to participate in its development.
- (B) UNIX kernel uses modules with well specified interfaces and provides advantages like simplified testing and maintenance of kernel. It has better extensibility as the kernel is not monolithic.
- (C) UNIX is kernel based operating system with two main components viz. process management subsystem and file management subsystem.
- (D) All devices are represented as files which simplify the management of I/O devices and files. The directories structure used is directed acyclic graph.

**Space For Rough Work**