

PAPER-II 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 : 1 ¼ hours]

[Maximum Marks : 100

Number of Pages in this Booklet : 8

Number of Questions in this Booklet : 50

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of fifty 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 Paper I 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 पचास 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 / पोलिथीन बैग को फाड़ लें । खुली हुई या बिना स्टीकर-सील / बिना पोलिथीन 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 आपकी 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 पत्र I 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 । हालांकि 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 – II

Note : This paper contains **fifty (50)** 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. COCOMO stands for
(A) Composite COst MOdel
(B) COntstructive COst MOdel
(C) COntstructive COmposite MOdel
(D) COmprehensive COnstruction MOdel
2. Match the following :
a. Good quality i. Program does not fail for a specified time in a given environment
b. Correctness ii. Meets the functional requirements
c. Predictable iii. Meets both functional and non-functional requirements
d. Reliable iv. Process is under statistical control
- Codes :**
- | | a | b | c | d |
|-----|-----|-----|-----|-----|
| (A) | iii | ii | iv | i |
| (B) | ii | iii | iv | i |
| (C) | i | ii | iv | iii |
| (D) | i | ii | iii | iv |
3. While estimating the cost of software, Lines Of Code (LOC) and Function Points (FP) are used to measure which one of the following ?
(A) Length of code
(B) Size of software
(C) Functionality of software
(D) None of the above
4. A good software design must have
(A) High module coupling, High module cohesion
(B) High module coupling, Low module cohesion
(C) Low module coupling, High module cohesion
(D) Low module coupling, Low module cohesion
5. Cyclometric complexity of a flow graph G with n vertices and e edges is
(A) $V(G) = e+n-2$
(B) $V(G) = e-n+2$
(C) $V(G) = e+n+2$
(D) $V(G) = e-n-2$
6. When the following code is executed what will be the value of x and y ?
int x = 1, y = 0;
y = x++;
(A) 2,1
(B) 2,2
(C) 1,1
(D) 1,2
7. How many values can be held by an array A(-1,m;1,m) ?
(A) m
(B) m^2
(C) $m(m+1)$
(D) $m(m+2)$

8. What is the result of the expression $(1\&2)+(3/4)$?
 (A) 1
 (B) 2
 (C) 3
 (D) 0
9. How many times the word 'print' shall be printed by the following program segment ?
 for (i=1, i≤2, i++)
 for (j=1, j≤2, j++)
 for (k=1, k≤2, k++)
 printf("print/n")
 (A) 1
 (B) 3
 (C) 6
 (D) 8
10. Which of the following is not a type of Database Management System ?
 (A) Hierarchical
 (B) Network
 (C) Relational
 (D) Sequential
11. Manager's salary details are to be hidden from Employee Table. This Technique is called as
 (A) Conceptual level Datahiding
 (B) Physical level Datahiding
 (C) External level Datahiding
 (D) Logical level Datahiding
12. A Network Schema
 (A) restricts to one to many relationship
 (B) permits many to many relationship
 (C) stores Data in a Database
 (D) stores Data in a Relation
13. Which normal form is considered as adequate for usual database design ?
 (A) 2NF
 (B) 3NF
 (C) 4NF
 (D) 5NF
14. If D_1, D_2, \dots, D_n are domains in a relational model, then the relation is a table, which is a subset of
 (A) $D_1 + D_2 + \dots + D_n$
 (B) $D_1 \times D_2 \times \dots \times D_n$
 (C) $D_1 \cup D_2 \cup \dots \cup D_n$
 (D) $D_1 - D_2 - \dots - D_n$
15. Which of the following addresses is used to deliver a message to the correct application program running on a host ?
 (A) Port
 (B) IP
 (C) Logical
 (D) Physical
16. In _____ substitution, a character in the plaintext is always changed to the same character in the ciphertext, regardless of its position in the text.
 (A) polyalphabetic
 (B) monoalphabetic
 (C) transpositional
 (D) multialphabetic
17. In classful addressing, the IP address 190.255.254.254 belongs to
 (A) Class A
 (B) Class B
 (C) Class C
 (D) Class D

18. In hierarchical routing with 4800 routers, what region and cluster sizes should be chosen to minimize the size of the routing table for a three-layer hierarchy ?
- (A) 10 clusters, 24 regions and 20 routers
 (B) 12 clusters, 20 regions and 20 routers
 (C) 16 clusters, 12 regions and 25 routers
 (D) 15 clusters, 16 regions and 20 routers

19. In IPv4 header, the _____ field is needed to allow the destination host to determine which datagram a newly arrived fragments belongs to.
- (A) identification
 (B) fragment offset
 (C) time to live
 (D) header checksum

20. Given $L1=L(a^*baa^*)$ and $L2=L(ab^*)$. The regular expression corresponding to language $L3 = L1/L2$ (right quotient) is given by
- (A) a^*b
 (B) a^*baa^*
 (C) a^*ba^*
 (D) None of the above

21. Given the production rules of a grammar G1 as
- $$S_1 \rightarrow AB \mid aaB$$
- $$A \rightarrow a \mid Aa$$
- $$B \rightarrow b$$
- and the production rules of a grammar G2 as
- $$S_2 \rightarrow aS_2bS_2 \mid bS_2aS_2 \mid \lambda$$
- Which of the following is correct statement ?
- (A) G1 is ambiguous and G2 is not ambiguous.
 (B) G1 is ambiguous and G2 is ambiguous.
 (C) G1 is not ambiguous and G2 is ambiguous.
 (D) G1 is not ambiguous and G2 is not ambiguous.

22. Given a grammar : $S1 \rightarrow Sc$, $S \rightarrow SA \mid A$, $A \rightarrow aSb \mid ab$, there is a rightmost derivation $S1 \Rightarrow Sc \Rightarrow SAC \Rightarrow SaSbc$

Thus, SaSbc is a right sentential form, and its handle is

- (A) SaS
 (B) bc
 (C) Sbc
 (D) aSb

23. The equivalent production rules corresponding to the production rules $S \rightarrow S\alpha_1 \mid S\alpha_2 \mid \beta_1 \mid \beta_2$ is

- (A) $S \rightarrow \beta_1 \mid \beta_2$, $A \rightarrow \alpha_1A \mid \alpha_2A \mid \lambda$
 (B) $S \rightarrow \beta_1 \mid \beta_2 \mid \beta_1A \mid \beta_2A$,
 $A \rightarrow \alpha_1A \mid \alpha_2A$
 (C) $S \rightarrow \beta_1 \mid \beta_2$, $A \rightarrow \alpha_1A \mid \alpha_2A$
 (D) $S \rightarrow \beta_1 \mid \beta_2 \mid \beta_1A \mid \beta_2A$,
 $A \rightarrow \alpha_1A \mid \alpha_2A \mid \lambda$

24. Given a Non-deterministic Finite Automation (NFA) with states p and r as initial and final states respectively and transition table as given below :

	a	b
p	-	q
q	r	s
r	r	s
s	r	s

The minimum number of states required in Deterministic Finite Automation (DFA) equivalent to NFA is

- (A) 5
 (B) 4
 (C) 3
 (D) 2

25. Which is the correct statement(s) for Non Recursive predictive parser ?

S1 : $\text{First}(\alpha) = \{t \mid \alpha \Rightarrow^* t\beta \text{ for some string } \beta\} \Rightarrow^* t\beta$

S2 : $\text{Follow}(X) = \{a \mid S \Rightarrow^* \alpha X a \beta \text{ for some strings } \alpha \text{ and } \beta\}$

- (A) Both statements S1 and S2 are incorrect.
- (B) S1 is incorrect and S2 is correct.
- (C) S1 is correct and S2 is incorrect.
- (D) Both statements S1 and S2 are correct.

26. Given an open address hash table with load factor $\alpha < 1$, the expected number of probes in a successful search is

- (A) Atmost $\frac{1}{\alpha} \ln \left(\frac{1-\alpha}{\alpha} \right)$
- (B) Atmost $\frac{1}{\alpha} \ln \left(\frac{1}{1-\alpha} \right)$
- (C) Atleast $\frac{1}{\alpha} \ln \left(\frac{1}{1-\alpha} \right)$
- (D) Atleast $\frac{1}{\alpha} \ln \left(\frac{\alpha}{1-\alpha} \right)$

27. For a B-tree of height h and degree t, the total CPU time used to insert a node is

- (A) $O(h \log t)$
- (B) $O(t \log h)$
- (C) $O(t^2 h)$
- (D) $O(th)$

28. The time complexity to build a heap with a list of n numbers is

- (A) $O(\log n)$
- (B) $O(n)$
- (C) $O(n \log n)$
- (D) $O(n^2)$

29. The value of postfix expression :

8 3 4 + - 3 8 2 / + * 2 \$ 3 + is

- (A) 17
- (B) 131
- (C) 64
- (D) 52

30. Consider the following statements for priority queue :

S1 : It is a data structure in which the intrinsic ordering of the elements does determine the result of its basic operations.

S2 : The elements of a priority queue may be complex structures that are ordered on one or several fields.

Which of the following is correct ?

- (A) Both S1 and S2 are incorrect.
- (B) S1 is correct and S2 is incorrect.
- (C) S1 is incorrect and S2 is correct.
- (D) Both S1 and S2 are correct.

31. Repository of information gathered from multiple sources, storing under unified scheme at a single site is called as

- (A) Data mining
- (B) Meta data
- (C) Data warehousing
- (D) Database

32. The task of correcting and pre processing data is called as

- (A) Data streaming
- (B) Data cleaning
- (C) Data mining
- (D) Data storming

33. Using data $p=3$, $q=11$, $n=pq$, $d=7$ in RSA algorithm find the cipher text of the given plain text SUZANNE
 (A) BUTAEEZ
 (B) SUZANNE
 (C) XYZABCD
 (D) ABCDXYZ
34. The relation “divides” on a set of positive integers is _____.
 (A) Symmetric and transitive
 (B) Anti symmetric and transitive
 (C) Symmetric only
 (D) Transitive only
35. Give as good a big-O estimate as possible for the following functions :
 $(n \log n + n^2)(n^3 + 2)$ and $(n! + 2^n)(n^3 + \log(n^2 + 1))$
 (A) $O(n^5 + 2n^2)$ & $O(n^3 * n!)$
 (B) $O(n^5)$ & $O(n^3 * 2^n)$
 (C) $O(n^5)$ & $O(n^3 * n!)$
 (D) $O(n^5 + 2n^2)$ & $O(n^3 * 2^n)$
36. A test contains 100 true/false questions. How many different ways can a student answer the questions on the test, if the answer may be left blank also.
 (A) $^{100}P_2$
 (B) $^{100}C_2$
 (C) 2^{100}
 (D) 3^{100}
37. Which of the following connected simple graph has exactly one spanning tree ?
 (A) Complete graph
 (B) Hamiltonian graph
 (C) Euler graph
 (D) None of the above
38. How many edges must be removed to produce the spanning forest of a graph with N vertices, M edges and C connected components ?
 (A) $M+N-C$
 (B) $M-N-C$
 (C) $M-N+C$
 (D) $M+N+C$
39. Which of the following shall be a compound proposition involving the propositions p , q and r , that is true when exactly two of the p , q and r are true and is false otherwise ?
 (A) $(p \vee q \wedge r) \vee (p \wedge q \wedge r) \wedge (\neg p \wedge q \vee r)$
 (B) $(p \wedge q \vee r) \wedge (p \wedge q \wedge r) \vee (\neg q \wedge \neg p \wedge r)$
 (C) $(p \wedge q \wedge r) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge r)$
 (D) $(p \vee r \wedge q) \vee (p \wedge q \wedge r) \vee (\neg p \wedge q \wedge r)$
40. The truth value of the statements :
 $\exists! x P(x) \rightarrow \exists x P(x)$ and $\exists! x \neg P(x) \rightarrow \neg \forall x P(x)$, (where the notation $\exists! x P(x)$ denotes the proposition “There exists a unique x such that $P(x)$ is true”) are :
 (A) True and False
 (B) False and True
 (C) False and False
 (D) True and True
41. How many different Boolean functions of degree 4 are there ?
 (A) 2^4
 (B) 2^8
 (C) 2^{12}
 (D) 2^{16}

42. A Boolean operator \ominus is defined as follows :
 $1 \ominus 1 = 1, 1 \ominus 0 = 0, 0 \ominus 1 = 0$ and $0 \ominus 0 = 1$
 What will be the truth value of the expression $(x \ominus y) \ominus z = x \ominus (y \ominus z)$?
 (A) Always false
 (B) Always true
 (C) Sometimes true
 (D) True when x, y, z are all true
43. Which one of the following is decimal value of a signed binary number 1101010, if it is in 2's complement form ?
 (A) -42
 (B) -22
 (C) -21
 (D) -106
44. A set of processors P1, P2, Pk can execute in parallel if Bernstein's conditions are satisfied on a pairwise basis; that is
 $P1 \parallel P2 \parallel P3 \parallel \dots \parallel Pk$ if and only if :
 (A) $P_i \parallel P_j$ for all $i \neq j$
 (B) $P_i \parallel P_j$ for all $i = j+1$
 (C) $P_i \parallel P_j$ for all $i \leq j$
 (D) $P_i \parallel P_j$ for all $i \geq j$
45. When a mobile telephone physically moves from one to another cell, the base station transfers ownership to the cell getting strongest signal. This process is known as _____.
 (A) handoff
 (B) mobile switching
 (C) mobile routing
 (D) cell switching
46. A virtual memory based memory management algorithm partially swaps out a process. This is an example of
 (A) short term scheduling
 (B) long term scheduling
 (C) medium term scheduling
 (D) mutual exclusion
47. Assuming that the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O block requests are 98, 37, 14, 124, 65, 67 :
 (A) 310
 (B) 324
 (C) 320
 (D) 321
48. Let the page fault service time be 10 millisecond(ms) in a computer with average memory access time being 20 nanosecond(ns). If one page fault is generated for every 10^6 memory accesses, what is the effective access time for memory ?
 (A) 21 ns
 (B) 23 ns
 (C) 30 ns
 (D) 35 ns
49. Consider the following UNIX command :
`sort <in> temp; head -30 <temp>; rm temp`
 Which of the following functions shall be performed by this command ?
 (A) Sort, taking the input from "temp", prints 30 lines from temp and delete the file temp
 (B) Sort the file "temp", removes 30 lines from temp and delete the file temp
 (C) Sort, taking the input from "in" and writing the output to "temp" then prints 30 lines from temp on terminal. Finally "temp" is removed.
 (D) Sort, taking the input from "temp" and then prints 30 lines from "temp" on terminal. Finally "temp" is removed.
50. The *mv* command changes
 (A) the inode
 (B) the inode-number
 (C) the directory entry
 (D) both the directory entry and the inode

Space For Rough Work

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