Signature and Name of Invigilator

1. (Signature) _____

   (Name) _____

2. (Signature) _____

   (Name) _____

Roll No. | | | | | | | |

(In figures as per admission card)

Roll No. _____

(In words)

Test Booklet No.

J–8705

PAPER – III

COMPUTER SCIENCE AND APPLICATIONS

Time : 2½ hours] **[Maximum Marks : 200**

Number of Pages in this Booklet : **36** Number of Questions in this Booklet : **26**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. Answers to short answer/essay type questions are to be given in the space provided below each question or after the questions in the Test Booklet itself.

   No Additional Sheets are to be used.
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 Test 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.**
4. Read instructions given inside carefully.
5. One page is attached for Rough Work at the end of the booklet before the Evaluation Sheet.
6. If you write your name or put any mark on any part of the Test booklet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
7. You have to return the Test booklet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
8. **Use only Blue/Black Ball point pen.**
9. **Use of any calculator or log table etc. is prohibited.**
10. **There is NO negative marking.**

परीक्षार्थियों के लिए निर्देश

1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए।
2. लघु प्रश्न तथा निबंध प्रकार के प्रश्नों के उत्तर, प्रत्येक प्रश्न के नीचे या प्रश्नों के बाद में दिये हुये रिक्त स्थान पर ही लिखिये।

   इसके लिए कोई अतिरिक्त कागज का उपयोग नहीं करना है।
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 सील को फाड़ लें। खुली हुई या बिना स्टीकर-सील की पुस्तिका स्वीकार न करें।
   (ii) **कवर पृष्ठ पर छपे निर्देशानुसार प्रश्न-पुस्तिका के पृष्ठ तथा प्रश्नों की संख्या को अच्छी तरह चैक कर लें कि ये पूरे हैं। दोषपूर्ण पुस्तिका जिनमें पृष्ठ / प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात किसी भी प्रकार की त्रुटिपूर्ण पुस्तिका स्वीकार न करें तथा उसी समय उसे लौटाकर उसके स्थान पर दूसरी सही प्रश्न-पुस्तिका ले लें। इसके लिए आपको पाँच मिनट दिये जायेंगे। उसके बाद न तो आपकी प्रश्न-पुस्तिका वापस ली जायेगी और न ही आपको अतिरिक्त समय दिया जायेगा।**
4. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें।
5. उत्तर-पुस्तिका के अन्त में कच्चा काम (Rough Work) करने के लिए मूल्यांकन शीट से पहले एक पृष्ठ दिया हुआ है।
6. यदि आप उत्तर-पुस्तिका पर अपना नाम या ऐसा कोई भी निशान जिससे आपकी पहचान हो सके, किसी भी भाग पर दर्शाते या अंकित करते हैं तो परीक्षा के लिये अयोग्य घोषित कर दिये जायेंगे।
7. आपको परीक्षा समाप्त होने पर उत्तर-पुस्तिका निरीक्षक महोदय को लौटाना आवश्यक है और इसे परीक्षा समाप्ति के बाद अपने साथ परीक्षा भवन से बाहर न लेकर जायें।
8. **केवल नीले / काले बाल प्वाईंट पैन का ही इस्तेमाल करें।**
9. **किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है।**
10. **गलत उत्तर के लिए अंक नहीं काटे जायेंगे।**

COMPUTER SCIENCE & APPLICATIONS

PAPER – III

प्रश्न-पत्र – III

NOTE: **This paper is of two hundred (200) marks containing four (4) sections. Candidates are required to attempt the questions contained in these sections according to the detailed instructions given therein.**

SECTION - I

NOTE: This section contains five (5) questions based on the following paragraph. Each question should be answered in about thirty (30) words and each carries five (5) marks.

(5 x 5 = 25 marks)

Consider following table structures for a library system :

STUDENT (membership_no, name, course)

BOOK (book_id, category, title, author, price, status)

BOOK_STATUS (book_id, membership_no, issue_date, return_date, fine_charged, fine_period)

Write SQL statement for the following.

1. Create Book table with proper constraints.

2. Delete all books where status is “lost”.

3. Increase fine charged by 10%, for all students whose return date is two weeks overdue.

4. Display membership_no; name of student who did maximum number of issue transaction in this academic year.

5. Draw STD (State Transition Diagram) for above.

SECTION - II

भाग – II

NOTE : This section contains fifteen (15) questions each to be answered in about thirty (30) words. Each question carries five (5) marks.

($5 \times 15 = 75$ marks)

6. Show the sequence of instruction required in stack oriented machine with two-addresses to execute : a/b+b*c/d.

7. Draw neat diagram of a BCD adder.

8. What is an attribute inheritance and why is it important ?

9. What are the different methods of maintaining synchronous replicas in a Distributed DBMS ?

10. What is anti-aliasing ?

11. What are the limitations of Z-buffer algorithm ?

12. Describe the function of lexical analyser and identify the tokens in the following 'C'-language statement : Cost = price * quantity :

13. What is the need for a separate layer, as transport layer, when error handling is done at data link layer ?

14. DNS uses UDP instead of TCP. If a DNS packet is lost, there is no automatic recovery. Does this cause a problem, and if so, how is it solved ?

15. Define Big-0 notation and list the complexity of Bubble sort, Quick sort and Merge sort using Big-0 notation

16. What do you understand by "data members" and "member function" of a class.

17. What is the use of Z-index attributes.

18. What is the use of SRS in software testing ?

19. Why compaction is necessary and list the over heads in compaction ?

20. How systems calls are executed in Unix Operating System, explain with an example ?

SECTION - III

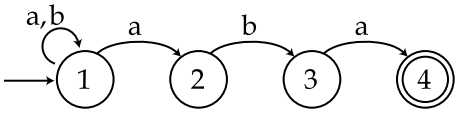
भाग – III

NOTE: This section contains five (5) questions from each of the electives / specialisations. The candidate has to choose only one elective / specialisation and answer all the five questions from it. Each question carries twelve (12) marks and is to be answered in about two hundred (200) words.

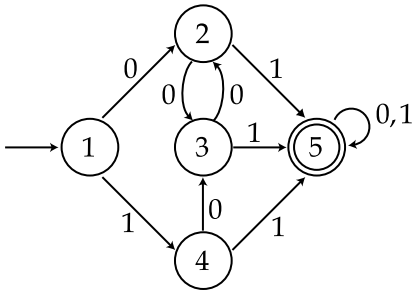
(12 x 5 = 60 marks)

Elective - I

21. Convert the following non-deterministic finite automata (NFA) to deterministic finite automata (DFA). Write the transitions for string 'abababa'.



22. Minimize the states of the deterministic finite automata given below and draw the transition diagram of the same.



23. Show that the following languages are not regular.

(i) $L = \{ a^n b^n \mid n \geq 1 \}$

(ii) $L = \{a^n b^m c^m d^n \mid n, m \geq 1\}$

24. Write a pushdown automata for the following language :

$L = \{ ww^R \mid w \in \{0, 1\}^* \}$

25. Write a turing machine for the following language.

$L = \{a^n b^n c^n \mid n \geq 1\}$

OR

Elective - II

21. Consider a discrete memoryless source probabilities : { 0.35, 0.25, 0.20, 0.15, 0.05}.

(I) Determine the Huffman code for this source and the average length $\overline{R}$ of the codewords.

(II) What is the efficiency of the code ?

22. Discuss Lamped-Ziev Codes and its information content. Compare this with Huffman Code.

23. If the generating matrix G = $\begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{bmatrix}$ encode the message { 100, 010, 111 }

24. Sampling and Quantization process are lossy processes, Justify. Also explain the relevence of Sampling and Quantization.

25. Discuss fractral image. Compression technique and give its advantages.

OR

Elective - III

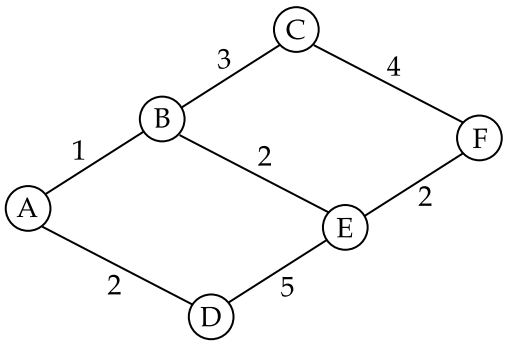
21. (i) Define Linear Programming Problem (LPP) in

(a) Standard form

(b) Cabonical form

(ii) Give an algorithm to convert the LPP in the standard form to the LPP in Cononical form.

22.



Apply the Dijkstra's algorithms to find the shortest path from A to F in the above shown figure.

23. Given Kuhn-Tucker optimality conditions for non-linear program. Apply KT method to solve the following.

(i) Min $Z = x_1^2 + x_2$

S.t $x_1^2 + x_2^2 + 9 = 0$

$-(x_1 + x_2^2) + 1 \geq 0$

(ii) Min $(2x_1^2 + x_2^2 + 4x_2 - 6x_2)$

S.t $x_1 + 3x_2 \leq 3$;

$x_1 \geqslant 0$ $(i = 1, 2)$

24. (i) A company sales two types of items A and B. Item A sales for Rs 25 per unit. No Quantity discount is given. The sales revenue for item B decreases as the no. of units sold increases and is given by :
Sales revenue = (30 - 0.30 x_2) x_2
where x_2 is the no. of units sold of item B.

(ii) Define Convex functions and Convex-regions.

25. Define the following :
1. Slack Variables
2. Surplus Variables
3. Optimal Solution
4. Basic Solution

OR

Elective - IV

21. Give the classification and explain the separability of XOR problem.

22. Explain Auto-associative memories and Hetero-associative memories with examples.

23. What is α -cut of a fuzzy set A ? Does the α-cut of a fuzzy set A give us another fuzzy set ? Explain.

24. Discuss the significance of Boltzmann learning Law and discuss its difficulties.

25. What do you mean by closure of a fuzzy binary relation ? Give an example.

OR

Elective - V

21. What are different Windows messages used in mouse processing ? Explain each one of them. **12**

22. Write program statements using windows functions to define an edit box of the size of the client area. It should occupy the whole client area even when the window size is changed. **12**

23. What is an asynchronous socket ? How does it support synchronization ? **12**

24. Explain, how to create a background process. How will you provide input to background process ? How will you terminate background process ? **12**

25. Define and differentiate among foreground, background and deamon processes. **12**

SECTION - IV

भाग – IV

NOTE: This section consists of one essay type question of forty (40) marks to be answered in about one thousand (1000) words on any of the following topics.

(40 x 1 = 40 marks)

26. (a) Write minmax algorithm and explain with suitable example the concept of Alpha-Beta Cut-off.

(b) Explain natural language processsing in detail.

OR

(a) Discuss the principle of backtracking Algorithms and write a program in either C or C^{++} to solve n-queen problem.

(b) Write tree diagram for solving a 4-queen problem.

OR

(a) Design a predictive parser for the grammer given below :

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid a \mid b \mid c$

(b) Show how the parser accepts the input (a + b) $*$ c

FOR OFFICE USE ONLY							
Marks Obtained							
Question Number	Marks Obtained	Question Number	Marks Obtained	Question Number	Marks Obtained	Question Number	Marks Obtained
1		26		51		76	
2		27		52		77	
3		28		53		78	
4		29		54		79	
5		30		55		80	
6		31		56		81	
7		32		57		82	
8		33		58		83	
9		34		59		84	
10		35		60		85	
11		36		61		86	
12		37		62		87	
13		38		63		88	
14		39		64		89	
15		40		65		90	
16		41		66		91	
17		42		67		92	
18		43		68		93	
19		44		69		94	
20		45		70		95	
21		46		71		96	
22		47		72		97	
23		48		73		98	
24		49		74		99	
25		50		75		100	

Total Marks Obtained (in words) .....

(in figures) .....

Signature & Name of the Coordinator .....

(Evaluation) Date .....