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.

D—8706

PAPER—III

COMPUTER SCIENCE AND APPLICATIONS

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

Number of Pages in this Booklet : **40** 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 Answer Sheet, 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 नज़्बर लिखिए।
2. लघु प्रश्न तथा निबंध प्रकार के प्रश्नों के उज़र, प्रत्येक प्रश्न के नीचे या प्रश्नों के बाद में दिये हुये रिज़्त स्थान पर ही लिखिये।

   इसके लिए कोई अतिरिज़्त कागज का उपयोग नहीं करना है।
3. परीक्षा प्रारज़्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी। पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निज़्नलिखित 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 संज़्या 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 ले। 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. उज़र-पुस्तिका के अन्त में कच्चा काम (Rough Work) करने के लिए मूल्यांकन शीट से पहले एक पृष्ठ दिया हुआ है।
6. यदि आप उज़र-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 उज़र-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 उज़र के लिए अंक नहीं काटे जायेंगे।**

COMPUTER SCIENCE AND APPLICATIONS

PAPER—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.

(5x5=25 marks)

ABC is a manufacturing company having a marketing department, which performs following activities :

- Preparation of Quotation
- Preparation of Order Acceptance
- Preparation of Manufacturing Advice

When the enquiry comes from the customer, marketing department will check that enquiry form against the customer and the given item details. If Company is manufacturing the items then they will prepare a quotation. In case, from the customer enquiry, if Company is manufacturing half of the items, then marketing department will prepare a quotation for those items only and for rest of the items they will prepare a rejection message.

After receiving the quotation from marketing department, customer will raise their purchase order according to the quotations terms and conditions.

After receiving the customer order, marketing department will prepare an order acceptance. After preparation of order acceptance, marketing department will prepare a Manufacturing Advice according to order acceptance. In this manufacturing advice, along with the necessary details, the quantity and delivery week number are mentioned, then it is forwarded to the planning department.

Analyse these business rules and :

1. Draw functional decomposition diagram.

2. E-R Diagram.

3. Draw context level DFD.

4. Design database.

5. List out queries and reports.

SECTION - II

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

(5x15=75 marks)

6. Implement a half adder using only NOR gates.

7. State the advantages of 16 bit microprocessor over 8 bit microprocessor.

8. Given that two different raster systems with resolutions of 640×480 and 1280×1024. What size frame buffer is needed for each of these systems to store 12 bits per pixel ? How much storage is required for each system if 12 bits per pixel are needed to be stored.

9. A polygon consists of three vertices A (2, 3), B (0, 10) and C (5, 10). If the polygon is moved such that A is at the new location (10, 10), find the new vertices of the polygon.

10. Why fragmentation and data replication are useful in Distributed DBMS ?

11. What are basic differences between optimistic concurrency control techniques and other concurrency control techniques ?

12. Compare multipath routing with flow-based routing.

13. What different types of Messages SNMP protocol can handle ?

14. What is Clipping in applet ? What is the relationship between clipping and repainting ?

15. What are three ways in which a thread can enter the waiting state ?

16. What are the management functions of an operating system ?

17. Explain the concept of recovery from deadlock.

18. Draw different flow charts whose cyclomatic complexity is equal to 3 ?

19. The cost estimation models are judged using both subjective and objective criteria - Justify.

20. Draw all the possible non-similar tree T, where T is a binary tree with 3 nodes.

SECTION - III

Note : This section contains five (5) Electives. The candidate has to choose one Elective and has to answer all the five questions from that Elective. Each question carries twelve (12) marks and is to be answered in about two hundred (200) words.

(12x5=60 marks)

Elective - I

21. State and prove Chomskyan hierarchy of Languages.

22. Construct Turing machine to accept $L = \left\{ 0^n / {}^{n}\!/_{n} \geq 0 \right\}$.

23. Explain context free grammar and regular grammar with example.

24. Prove that the following language is not regular using Pumping Lemma $L = \left\{ 0^{i^z} / i \geq 0 \right\}$.

25. Let A = {a, b}. Construct an automaton M such that L (M) will consist of those words W which begin with a and end in b.

OR

Elective - II

21. Consider the following generator matrix over GF (Z).

$$G = \begin{bmatrix} 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

(a) Generate all possible code words using this matrix.

(b) Find the parity check matrix H.

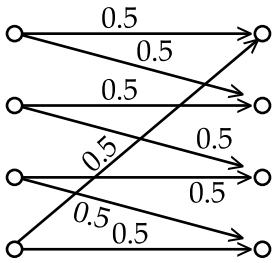
(c) What is the minimum distance of this code ?

(d) How many errors can this code detect ?

(e) How many errors can this code correct ?

(f) Construct the standard array of this code.

22. Find the capacity of the channel of the following graph.



23. (a) Consider a discrete Memoryless Source with source probabilities {0.30, 0.25, 0.20, 0.15, 0.10}. Find the source entropy, H (X).

(b) Show that C = {0000, 1100, 0011, 1111} is a linear code. What is its minimum distance ?

24. Describe MPEG1 and MPEG2 standards of compression.

25. Explain any one method of edge detection in image processing.

OR

Elective - III

(Operations Research)

21. Find by simplex method non-negative solutions of the following system of equations :

$$\begin{aligned} X_1 \qquad\quad - X_3 + X_4 &= 3 \\ 2X_1 + X_2 \qquad\qquad &= 3 \\ 3X_1 - 2X_2 \qquad - X_4 &= 1 \end{aligned}$$

22. Prove that a solution X_0 of the quadratic programming problem :

$$\text{Minimize} \quad P^T X + \frac{1}{2} X^T C X$$

Subject to $\quad AX \geqslant b,$

$\qquad\qquad X \geqslant 0$

is also a solution of the problem

$$\text{Minimize} \quad P^T X + \frac{1}{2} X_0^T C X$$

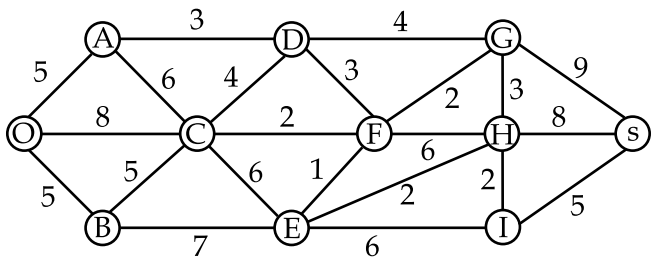
Subject to $\quad AX \geqslant b,$

$\qquad\qquad X \geqslant 0$

Where C is symmetric positive semi-definite matrix.

23. (a) Show that for any network, the maximal flow value from source to sink is equal to the minimal cut capacity of all cuts, separating source and sink.

(b) Find the shortest route through the following Network.



24. (a) Prove that a collection of all feasible solutions of a linear Programming Problem

Maximize $C^T X$

Subject to $AX \leq b$

$X \geqslant 0$

constitute a convex set.

(b) Use Vogal's Approximation Methods to Obtain an initial basic feasible solution of following Transportation problem, then find the optimal solution.

		To				
		D	E	F	G	Availability
	A	11	13	17	14	250
From	B	16	18	14	10	300
	C	21	24	13	10	400
Demand		200	225	275	250	

25. (a) Show that if X_Θ is a solution of the problem.

Minimization

Subject to $AX = b$

$X \geqslant 0$

Then $X_\Theta^T C X_\Theta$ is a monotonically increasing function of .

(b) Let $f(x)$ be a function of $X \in E_n$, which is differentiable with continuous partial derivatives and let the gradient vector in X be denoted by g (X). Show that the following are equivalent.

(i) $f(X)$ is convex

(ii) $f(X_2) - f(X_1) \geqslant g^T(X_1)(X_2 - X_1)$ for any two vectors $X_1, X_2 \in E_n$

(iii) is a monotonically non-decreasing as function of λ for any X and S

T denotes Transposition.

OR

Elective - IV

21. Distinguish between linear separability and linear independence.

22. Explain concept of feed forward Neural-network with an example.

$g^T(X + \wedge S).S$

23. Distinguish between supervised and unsupervised learning with suitable example.

24. What is meant by membership in a fuzzy set ? Illustrate triangular membership.

25. What do you mean by defuzzification ? Explain any two methods of defuzzification.

OR

Elective - V

21. Explain the significance of the repeat factor used in more. How do you search for the pattern include in a file and repeat the search ? What is the difference between this repeat command and the dot command ?

22. What types of variables are PATH and HOME ? Why are they called variables ? In what ways are they used ? What is sed ?

23. How is a client-server environment created in X ? What is xterm ?

24. (a) Explain three command line options handed by X Client.

(b) Explain dtfile, xbiff, xload.

25. (a) Explain Terminal Emulator under X Windows.

(b) Explain xclipboard.

SECTION - IV

Note : This section consists of one question carrying (40) marks.

(40x1=40 marks)

26. (a) Write the conceptual dependency diagram for following sentence.

"Thomas had given a ring to Mary".

(b) Solve the following using state space representation :

You are given two jugs, a 4 liter one and a 3 liter one. Neither has any measuring marks on it. There is a pump that can be used to fill jug with petrol. How can you get exactly 2 liter of petrol in to 4 liter jug ?

OR

(a) State the 8 queen's problem and solve it by using backtracking.

(b) A binary tree is stored in memory. Write a recursive procedure which finds the number of nodes in the binary tree.

OR

(a) Construct SLR parser for the following grammar.

$E \rightarrow E + T,$	$E \rightarrow T$
$T \rightarrow T * F,$	$T \rightarrow F$
$F \rightarrow \underline{id}$	

Is the following grammar is LL(1) grammar ? Justify your answer.

$S \rightarrow AA$

$A \quad bA/d$

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

(in figures) .....

Signature & Name of the Coordinator .....

(Evaluation) Date .....