PAPER-III
COMPUTER SCIENCE & APPLICATIONS

Signature and Name of Invigilator

1. (Signature) _____
   (Name) _____
2. (Signature) _____
   (Name) _____

Roll No. | | | | | | | | |
(In figures as per admission card)

Roll No._____
(In words)

D 8 7 1 1

Time : **2 1/2** hours] [Maximum Marks : **200**

Number of Pages in this Booklet : **32** Number of Questions in this Booklet : **19**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. Answer 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 Question 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, Roll Number, Phone Number 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, or use abusive language or employ any other unfair means, 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.**

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 हुए 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 कागज की 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 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 ।**
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 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 ।
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 पेन का ही इस्तेमाल करें ।**
9. **किसी भी प्रकार का संगणक (केलकुलेटर) या लॉग टेबल आदि का प्रयोग वर्जित है ।**

COMPUTER SCIENCE & APPLICATIONS

PAPER – III

प्रश्नपत्र – 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.

Answer to all questions must be written in English only.

SECTION – I

Note : This section consists of **two** essay type questions of **twenty (20)** marks each, to be answered in about **five hundred (500)** words each. **(2 × 20 = 40 marks)**

1. (a) Compare and contrast the TCP/IP Stack with the OSI model. What factor do you think will affect setting an appropriate TCP time out period before the sending host performs a retransmission ?

   (b) Briefly explain the major difference between Ethernet V2.0 and IEEE 802.3.

OR

   (a) What are the necessary and sufficient conditions for Deadlock ? Explain in brief each of them.

   (b) What is a semaphore and how it is used to prevent entry in the critical section ?

2. (a) What do you mean by a software process ? What is the difference between a methodology and a process ? What problem will a Software Development house face if it does not follow any systematic process in its software development efforts ?

(b) Which are the major phases in the waterfall model of software development ? Which phase consumes the maximum effort ?

OR

(a) Show that a static two phase locking schedule satisfies the condition for dynamic two phase locking. Is the converse true ?

(b) Propose a multi version protocol base on locking. Prove that the protocol is safe. Compare the performance of this protocol with the one based on time stemp ordering.

SECTION – II

Note : This section contains **three (3)** questions. From each of the electives/specializations, the candidate has to choose only one elective/specialization and answer all the **three** questions contained therein. Each question carries **fifteen (15)** marks and is to be answered in about **three hundred (300)** words. **(3 × 15 = 45 Marks)**

TOC

Elective – I

3. Suppose $L \subseteq E^*$ and for some positive integer n_1 there are n strings in E^* , any two of which are distinguishable with respect to L. Prove that every FA reorganising L must have at least n states.

4. If L_1 & L_2 are context free languages $L_1 \cup L_2$, $L_1 L_2$ and L_1^* are also CFLs.

5. If L_1 & L_2 are recursively enumerable languages over Σ , then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursively enumerable.

OR

Elective – II
Image Processing

3. (a) What are the kinds of degradation that can be easily restored ? Explain inverse filteration and wiener filteration method.

   (b) A source emits 6 symbols with probabilities 1/2, 1/4, 1/8, 1/16, 1/32, 1/32. Determine its Huffman code.

4. (a) State and prove Shannon channel capacity theorem.

(b) Explain sub band coding. What is the significance of down sampling and up sampling in sub band coding ?

5. (a) What is image registration ? And explain image to image registration.

(b) Explain turbo and convulsional codes.

OR

Elective – III

3. Solve the following Linear Programming Problem by the Revised Simplex Method :

Maximize $Z = 2x_1 + 2x_2$

Subject to $3x_1 + 4x_2 \leq 6$

$6x_1 + x_2 \leq 3$

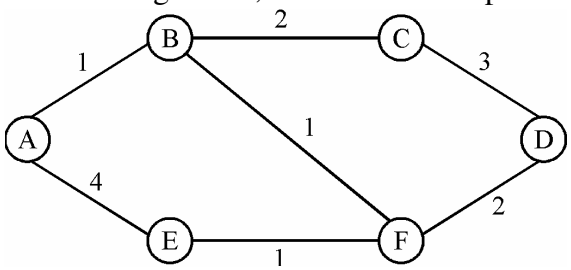
$x_1, x_2 \geq 0$

4. Goods have to be transported from source S_1, S_2 and S_3 to destination D_1, D_2 and D_3. The transportation cost per unit, capacities of the sources and requirements of the destination are given in the following table.

	D_1	D_2	D_3	Supply
S_1	8	5	6	120
S_2	15	10	12	80
S_3	3	9	10	8
Demand	150	80	50	

What schedule to be used to minimize the transportation cost ?

5. Using the Bellman – Ford Algorithm, find the shortest path.



OR

Elective – IV

3. Compare solving XOR problem using RBF and multilayer perception with one hidden layer which one would you prefer & why ?

4. A neuron j receives inputs from four other neurons whose activity levels are 10, –20, 4, –2. The respective synaptic weights of neuron j are 0.8, 0.2, –1.0 and –0.9. Calculate the output of neuron j for the following two situations :

(a) The neuron is linear.

(b) The neuron is represented by a Mc Culloch – Pitts model.

5. Let x be a linguistic variable that measures a university's academic excellence, which takes values from the universe of discourse U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}. Suppose the term set of x includes Excellent, Good, Fair and Bad. The membership functions of these linguistic labels are listed below :

- $\mu_{Excellent}$ = {(8, 0.2), (9, 0.6), (10, 1)}
- μ_{Good} = {(6, 0.1) (7, 0.5) (8, 0.9), (9,1), (10,1)}
- μ_{Fair} = {(2, 0.3) (3, 0.6) (4, 0.9) (5, 1) (6, 0.9) (7, 0.5) (8, 0.1)}
- μ_{Bad} = {(1, 1) (2, 0.7) (3, 0.4) (4, 0.1)}

Construct the membership functions of the following compound sets :

- Not Bad but Not Very Good
- Good but Not Excellent

OR

Elective – V

UNIX

3. (a) Explain terminal emulator under X windows and also explain X clip board.
   (b) What are 3 modes of Vi editor and various commands used in them ?

4. (a) What is the use of 'grep', 'egrep', 'fgrep' Command ?
   (b) How is client server environment created in X ? Explain 3 command line options handled by X client.

5. (a) Describe briefly six windows functions usually called while creating a window.
   (b) What is the difference between UNIX and Windows Navigation and directory control commands ?

SECTION – III

Note : This section contains **nine (9)** questions of **ten (10)** marks each, each to be answered in about **fifty (50)** words. **(9 × 10 = 90 Marks)**

6. What is the difference between centralized routing and distributed routing ?

7. Can a system detect that some of its processes are starving ? If yes, then explain how it can ? If no, then explain how the system can deal with starvation problem.

8. Show how a B_ tree and B^+ tree can be used to implement a priority queue. Also show that any sequence of n insertion and minimum deletion can be performed in o(nlogn) steps.

9. Obtain the logic diagram of a master-slave JK flip flop with AND and NOR Gates, include provision for setting and clearing the flip flop asynchronously.

10. Two binary trees are similar if they are either empty or both non-empty and have similar left and right sub trees. Write a function in C++ to decide whether two binary trees are similar. What is the running time of your function ?

11. Find the Normalization transformation that maps a windows whose lower left is at (1,1) and Upper right (3, 5) onto a view port that has lower left corner at (0, 0) and Upper right corner at (½, ½).

12. Consider the following piece of Knowledge: Mary, Micky and John are members of rotary club. Every rotary club member who is not a swimmer is a mountain climber. Mountain climber do not like rains. Any one who does not like water is not a swimmer. Micky dislikes whatever Mary likes and likes whatever Mary dislikes. Mary likes rain and water.
    (a) Represent this Knowledge as predicate statement.
    (b) Answer the query. Is there a member of Rotary club who is not a mountain climber but a swimmer using resolution method.

13. Compare the relative advantages of using the iterative waterfall model and the spiral model of software development. Explain with the help of few suitable examples, the types of problem for which you would adopt above models.

14. What is the basic difference between optimistic concurrency control and other concurrency control technique. Describe the different phases of an optimistic concurrency control scheme.

SECTION – IV

Note : This section contains **five (5)** questions of **five (5)** marks each. Each question should be answered in about **thirty (30)** words. **(5 × 5 = 25 Marks)**

15. An eight way set associative cache consists of a total of 256 Blocks. The main memory contains 8192 blocks, each consisting of 128 words.

    (a) How many bits are there in the main memory address ?

    (b) How many bits are there in TAG, SET and WORD fields ?

16. Why does LAN tend to use Broadcast Network ? Why not use Networks consisting of multiplexer and switches ?

17. How would you improve a software design that displays very low cohesion and high coupling ?

18. What are the types of collision resolution techniques and the method used in each of these types ?

19. Why are segmentation and paging sometimes combined into one scheme ?

Space For Rough Work

FOR OFFICE USE ONLY	
Marks Obtained	
Question Number	Marks Obtained
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
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16	
17	
18	
19	

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

(in figures) .....

Signature & Name of the Coordinator .....

(Evaluation) Date .....