COMPUTER SCIENCE & APPLICATIONS

Paper - III

Signature of Invigilators

1. .....

2. .....

Roll No. ☐☐☐☐☐
(In figures as in Admit Card)

JY–06/19

Roll No. .....

.....
(in words)

Name of the Areas/Section (if any).....

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

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. Write name of your Elective/Section if any,
3. Answer to short answer/essay type questions are to be written in the space provided below each question or after the questions in test booklet itself. No additional sheets are to be used.
4. Read instructions given inside carefully.
5. Last page is attached at the end of the test booklet for rough work.
6. If you write your name or put any special mark on any part of the test booklet which may disclose in any way your identity, you will render yourself liable to disqualification.
7. Use of calculator or any other Electronics Devices is prohibited.
8. There is no negative marking.
9. You should return the test booklet to the invigilator at the end of the examination and should not carry any paper outside the examination hall.

પરીક્ષાર્થીઓ માટે સૂચનાઓ :

૧. આ પૃષ્ઠના ઉપલા ભાગે આપેલી જગ્યામાં તમારી ક્રમાંક સંખ્યા (રોલ નંબર) લખો.

૨. તમે જે વિકલ્પનો ઉત્તર આપો તેનો સ્પષ્ટ નિર્દેશ કરો.

૩. ટૂંકનોંધ કે નિબંધ પ્રકારના પ્રશ્નોના ઉત્તર દરેક પ્રશ્નની નીચે આપેલી જગ્યામાં જ લખો. વધારાના કોઈ કાગળનો ઉપયોગ કરશો નહીં.

૪. અંદર આપેલી સૂચનાઓ ધ્યાનથી વાંચો.

૫. આ ઉત્તરપોથીમાં અંતે આપેલું પૃષ્ઠ કાચા કામ માટે છે.

૬. આ ઉત્તરપોથીમાં ક્યાંય પણ તમારી ઓળખ કરાવી દે એવી રીતે તમારું નામ કે કોઈ ચોક્કસ નિશાની કરી હશે તો તમને આ પરીક્ષા માટે ગેરલાયક ગણવામાં આવશે.

૭. કેલક્યુલેટર અથવા ઈલેક્ટ્રોનિક્સ સાધનો નો ઉપયોગ કરવો નહીં.

૮. નકારાત્મક ગુણાંકપદ્ધતિ નથી.

૯. પ્રશ્નપત્ર લખાઈ રહે એટલે આ ઉત્તરપોથી તમારા નિરીક્ષકને આપી દેવી. પરીક્ષાખંડની બહાર કોઈ પણ પ્રશ્નપત્ર લઈ જવું નહીં.

FOR OFFICE USE ONLY
MARKS OBTAINED

Question Number	Marks Obtained	Question Number	Marks Obtained	Question Number	Marks Obtained
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10					
11.					

Total Marks obtained .....

Signature of the co-ordinator .....
(Evaluation)

SEAL

COMPUTER SCIENCE & APPLICATIONS
Paper - III

NOTE : This paper has FOUR SECTIONS

SECTION - I

NOTE : Questions 1 - 5 are to be answered in upto 30 words each in the space provided after each question. [25 marks]

Read the following information carefully. Question No. 1 - 5 are based upon it.

The main objective of Short-term scheduler is to allocate processor time in such a way as to optimize one or more aspects of system behavior. Generally, a set of criteria is established against which various scheduling policies may be evaluated. Examples of user-oriented, performance related criteria include (a) Turnaround time, (b) Response time, (c) Fairness. One of the user-oriented criteria, other than performance, is Predictability. Some of the characteristics of various scheduling policies are given below.

Scheduling Policy	Decision Mode	Throughput	Response Time	Overhead	Effect on Processes
FCFS	Non-preemptive	Not emphasized	May be high	Minimum	Penalizes short processes & also I/O bound processes
Round Robin	Pre-emptive (at time quantum)	May be low if quantum is too small	Provides response time for short processes	Minimum	Fair treatment
Shortest Process Next	Non-preemptive	High	Provides response time for short processes	Can be high	Penalize long processes
Feedback	Pre-emptive (at time quantum)	Not emphasized	Not emphasized	Can be high	May favor I/O bound process

1. Which of the scheduling policies is best suited for medium to long scientific computation oriented tasks? Explain briefly.

2. Which of the scheduling policies is best suited for a mix of tasks containing majority of short to medium scientific computational tasks? Explain briefly.

3. Which of the scheduling policies is best suited for commercial applications? Explain briefly.

4. Which of the scheduling policies is best suited for a random mix of jobs in terms of size and quantum of I/O? Explain briefly.

5. For a real-time application, which of the scheduling policies is best suited? Explain briefly.

SECTION-II

NOTE : QuestionNumbers 6 - 20 are to be answered in upto 30 words each in the space provided after each question. [75 marks]

6. Prove that NOR gates are universal gates.

7. Construct an E-R diagram for a Hospital with set of patients and set of doctors. Associate with each patient a log of various tests and examinations conducted.

8. Consider a view branch-cust defined as follows:

```
create view branch-cust as
        select branch-name, customer-name
from depositor, account
where depositor.account-number = account.account-number
```

Suppose that the view is materialized, that is, the view is computed and stored. Write active rules to maintain the view, that is, to keep it up to date on insertions to and deletions from depositor or account. Do not bother about updates.

9. With reference to computer graphics, explain the Even-Odd method to determine whether a point is inside a polygon or outside, Illustrate through examples graphically.

10. Define and explain the concepts of Polymorphism.

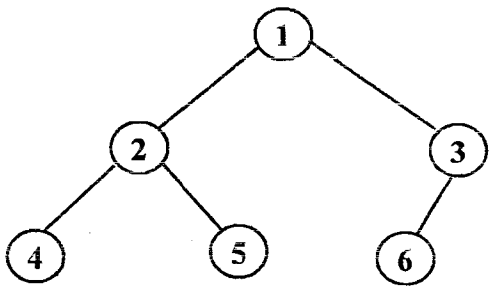
11. Discuss Pass-2 of Two Pass Assembler.

12. Compare and contrast Static versus Dynamic storage allocation during compilation process.

13. Compare a host to host protocol such as IP to a port to port protocol such as TCP.

14. The last executable statement of some function is a recursive call to the function itself. How can you convert this function into a non-recursive function?

15. Define a Binary Tree. Write preorder traversal of the following Binary tree.



16. Consider the class Point and the class Triangle that has three attributes of Point type representing vertices of the triangle. Discuss the concept of aggregation in this context as a means of reuse of classes as against inheritance.

17. Quality is a prerequisite for Reliability. Comment on the statement.

18. What is the role of h( ) function in the A^* algorithm for heuristic search?

19. List briefly different methods for Knowledge representation.

20. Draw and explain a process state diagram for scheduling of processes in an operating system.

SECTION III

NOTE : Question Numbers 21 - 25 are all to be attempted from a single elective only. Each question may be answered in upto 200 words each. [60 marks]

21. Define the Chomsky hierarchy of languages. Give an example for each type of language.

22. Describe with an example the use of a Push-Down Automaton (PDA). What are the problems that can not be solved by a DFA but can be solved by a PDA? Show a palindrome example.

23. Give examples of regular expressions. Show how parsing can be done for a general CFG.

24. The Church-Turing thesis states that a Turing machine can be built for any problem that can be solved with an effective algorithm. Explain how this is related to the halting problem of Turing machines.

25. Construct a NDFA that recognizes the language generated by the regular grammer G = (V, T, S, P) where V = {0, 1, A, S}, T = {0, 1} and the productions are S ? 1A, S $\rightarrow$ 0, S $\rightarrow$ λ, A $\rightarrow$ OA, A $\rightarrow$ 1A, and A $\rightarrow$ 1.

OR

21. Explain the terms (i) Entropy of a source, (ii) Information content of a message.

22. Explain working of a CRC checker with an example.

23. Explain the Spatial and Gray level resolution of images.

24. Get the Fourier transform of a pulse and explain its significance.

25. Explain LZW coding and show how it will be useful for image compression.

OR

21. State the general non-linear programming problem. Solve the following non-linear programming problem graphically.

Maximize $Z = 8x_1 - x_1^2 + 8x_2 - x_2^2$

Subject to the constraints

$x_1 + x_2 \leq 12$

$x_1 - x_2 \geq 4$

and $x_1, x_2 \geq 0$

22. Give a brief description of LP problem. Solve the following LPP by the Simplex method.

A company manufactures two kinds of machines, each requiring a different manufacturing technique. The deluxe machine requires 18 hours of labor, 8 hours of testing and yields a profit of Rs. 400. The standard machine requires 3 hours of labor, 4 hours of testing and yields a profit of Rs. 200. There are 800 hours of labor and 600 hours of testing available each month. A marketing forecast has shown that the monthly demand for the standard machine is to be more than 150. The management wants to know the number of each model to be produced monthly that will maximize total profit. Formulate and solve this problem by the Simplex method.

23. Indicate how you will test for optimality of initial feasible solution of a Transportation problem.

24. Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table. Find the assignment of men to jobs that will minimize the total time taken.

		Jobs				
		I	II	III	IV	V
	A	2	9	2	7	1
	B	6	8	7	6	1
Men	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

25. Explain Dijkstra's algorithm to find the shortest path between two given vertices of a given weighted graph.

OR

21. The learning of a Multi-layer perceptron can be described as that of minimizing the mean square error. Write suitable equations to justify this statement, specifically with respect to error at the output layer neuron and hidden layer neuron.

22. Show that the weight update formula for learning in a Hopfield network is of the form of Hebbian learning where the weight change of link between neurons k and j is proportional to the product of input x_k and the output y_j.

23. In a multilayer perceptron the method of weight adjustment is called as Error Backpropagation. However, these networks are also called as feed-forward neural networks. Explain using a diagram and suitable equations both of these terms.

24. Define the terms Fuzzy set, Linguistic Variable, α - cut and Fuzzy if-then rule. Explain the fuzzy compositional rule of inference with an example.

25. Consider the Fuzzy set A whose membership function is

$$A(x) = \begin{cases} 0.5(x/3 - 5/3), \text{ if } 5 \leq x \leq 8 \\ -0.5(x/3 - 11/3), \text{ if } 8 < x \leq 11 \\ 0 \text{ otherwise} \end{cases}$$

(i) Sketch the graph of the function, decide whether it is normal and specify its height.

(ii) Give a linguistic description of the concept conveyed by A.

OR

21. (A) Discuss Security measures of a File System under Unix.
(B) Show how a message can be captured in active window with an example.

22. (A) How can multitasking be achieved by threads under the Windows operating system?
(B) Define Multitasking. How it can be achieved under Unix?

23. (A) Discuss structure of lex utility giving example.
(B) Define MDI. Explain how variables as a shared between windows?

24. (A) Discuss Scroll Bar Messages giving example.
(B) Define Regular expression. Discuss various common meta-characters used in defining regular expression.

25. (A) Define Modal and Modeless Dialog box. Differentiate between them.
(B) Giving example show how Shared Memory can be used in process synchronization under Unix.