Signature of Invigilators

1. .....

2. .....

COMPUTER SCIENCE & APPLICATIONS
Paper III

Roll No. | | | | | |

(In figures as in Admit Card)

Roll No. .....

.....

(In words)

JY—04/19

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

Time Allowed : $2\frac{1}{2}$ 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 are 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. ટૂંક નોંધ 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 ઉત્તર પોથીને અંતે આપેલું પૃષ્ઠ કાચા કામ માટે છે.

૬. આ ઉત્તર પોથીમાં ક્યાંય પણ તમારી ઓળખ કરાવી દે એવી રીતે તમારું નામ કે કોઈ ચોકકસ નિશાની કરી હશે તો તમે આ પરીક્ષા માટે ગેરલાયક સાબીત થશો.

૭. કેલકયુલેટર અથવા ઈલેકટ્રોનિકસ સાધનો જેવાનો ઉપયોગ કરવો નહીં.

૮. નકારાત્મક ગુણાંક પદ્ધતિ નથી.

૯. પ્રશ્નપત્ર લખાઈ રહે એટલે આ ઉત્તર પોથી 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 AND APPLICATIONS

PAPER-III

Note : This paper has two Parts (A and B). All questions are compulsory in Parts A and B.

Part A

Note : This part has ten short essay type questions to be answered in about **300** words each.

1. (*a*) Explain with the help of suitable diagrams, how shift registers can be used for converting serial data to parallel data and vice versa. 6

   (*b*) Design a combinational circuit that converts a decimal digit from 2421 code to 8421 code. 10

2. (*a*) Explain what you understand by entities and relations in an E-R diagram. 6

(*b*) Construct a suitable E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. 10

3. (*a*) Describe the construction and working of a mechanical mouse. 6

(*b*) Define the terms : Refresh buffer, Pixmap perspective projection. 3

(*c*) Derive the transformation matrix in 2 D for obtaining the reflection of a point P(A, B) with repect to the line $2y = \sqrt{3}x + 2$ using homogeneous co-ordinates. 7

4. (*a*) What is meant by 'readability' of a programming language ? What are the factors which improve readability ? 4

(*b*) What do you mean by context free grammar ? Give an example. 5

(*c*) What is meant by 'left recursion' ? Write the steps for eliminating left recursion. 5

(*d*) Discuss the applications of LEX giving suitable examples. 2

5. (*a*) How can block coding aid in error detection ? Explain with a suitable example. 4

(*b*) State and explain Nyquist theorem. 3

(*c*) Draw the signal plot of amplitude versus time of the differential Manchester Encoding for the bit string 01001110. 4

(*d*) Explain the working of ARP protocol to find the MAC addresses in TCP/IP network layer operations. What is RARP ? 5

6. (*a*) Define O ('Big O') Θ (big θ) and Ω (big omega) notations. When do we use Θ (big θ) notation ? 4

(*b*) Explain the circular implementation of a queue. How is it better as compared to a linear array implementation ? Write a procedure/function to enter an element in the queue described above. 6

(*c*) Apply Quicksort algorithm to the following array of elements 16, 21, 6, 9, 96, 13, 81, 18, 10, 5.

Show intermediate results also. 6

7. (*a*) How are SGML, HTML and XML related ? 2

(*b*) Specify the HTML tags for creating and populating a table. 3

(*c*) Specify the syntax for creating a new object of a given class, 'Point', and store its reference in the variable X. 2

(*d*) Specify what is a class diagram in object-oriented design. 3

(*e*) How is polymorphism different from method over-loading ? Describe how over-ridden methods constitute the framework for polymorphism. 3

(*f*) Write Java code for creating a top-level window with the window being closed when the 'exit' button is clicked. 3

8. (*a*) In the context of Software Engineering what is understood by 'cohesion' ? How is it different from coupling ? 8

(*b*) Discuss situations where prototyping is the most appropriate software development model. 8

9. (*a*) How does a thread differ from a process ? Discuss kernel level threads and user level threads. 8

(*b*) Describe the steps taken by event handler when a time-slice expires. 8

10. (*a*) Breadth first search is proved to be an admissible search method, in the sense that it is guranteed to find an optimal path to a goal if one exists. Explain why depth first search is not admissible. 4

(*b*) Explain why A* search is admissible only under certain conditions. Explain the conditions for A* admissibility. 4

(*c*) Describe briefly the main blocks and working of an expert system 8

Part B

Note : This part has only one question of 40 marks to be answered in about 800 words.

11. (*a*) Explain the Turing machine model and justify how it can be used as a universal computing machine. 20

(*b*) Prove that context free language and push down automata are equivalent. 20

Or

(*a*) Explain the concept of Shannon's entropy. Explain its use in the communication of information. 10

(*b*) Explain the use of LZ codes for lossless data compression. 10

(*c*) Explain the application of Fourier transforms in the spatial domain. What does filtering in Fourier domain correspond to in the Spatial domain ? 10

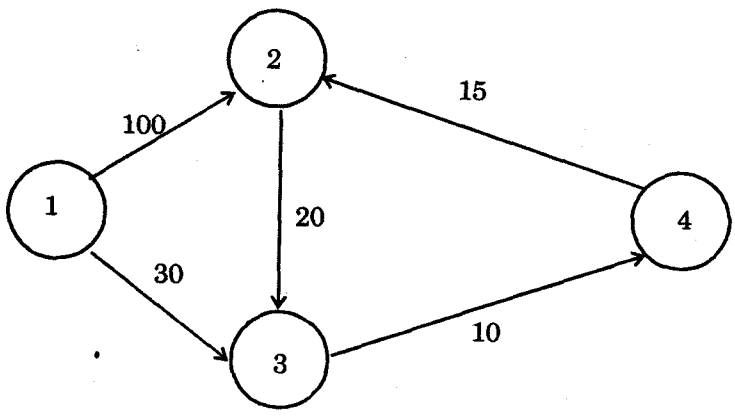
(*d*) Explain video compression using MPEG standard. 10

Or

(*a*) What do you mean by Degenerate solution of a LPP ? Give its two implications. 8

(*b*) Write the steps for solving assignment problem using Hungarian method. 10

(*c*) Find the shortest paths from node 1 to other nodes using Dijkstra's algorithm, the entries along the edges indicate the distance in kms. 10



(*d*) Consider the non-linear programming problem :

Max $Z = f(X)$

s.t. : $g(X) \leq 0$

$X = (x_1, x_2, \ldots\ldots, x_n)$

$g = (g_1, g_2, \ldots\ldots, g_m)^T$

$X \geq 0$ condition is included in the constraints. Derive the Kuhn-Tucker necessary condition for optimality. 12

Or

(*a*) Draw the recurrent Hopfield network of four nodes. Explain how a Hopfield net works as a 'content addressable memory'. 14

(*b*) Derive the Least Mean Square learning rule for the weight adjustment of a single layer perceptron. 14

(*c*) Explain how fuzzy set representation can be used to represent the temperature ranges 'very cold, cold, warm, hot, very hot' ? Draw the membership functions for each of the above linguistic variables. 12

Or

(*a*) List features of UNIX operating system. Explain any *two* of them.

(*b*) Define the following terms : Shell, I-node, File system, PCB, MDI, Unicode. 12

(*c*) Explain link( ) system call giving example. 4

(*d*) Explain multithreading concept in windows based programming giving example. 10

(*e*) Discuss features of windows environment. 6