This question paper contains 8 printed pages]

CODE : FRO-2017

COMPUTER APPLICATIONS/ COMPUTER SCIENCE

Roll No. .....

Time : 3 *Hours* *Maximum Marks :* 200

Note :— (1) Question paper consists of *two* parts viz. Part I and Part II. Each part contains *four* questions. The paper as a whole carries eight questions. Question Nos. **1** and **5** are compulsory. The candidates are required to attempt *three* more questions out of the remaining six questions taking at least *one* question from each part *i.e.*, this is in addition to the compulsory question of each part. Attempt *five* questions in all. All questions carry equal marks. The parts of a question are to be attempted at one place in continuation. Answers should be brief and to the point.

(2) Parts of same question must be attempted together and not to be attempted in between the answers to other questions.

P.T.O.

PART–I

1. (*a*) Perform the indicated operations for the binary equivalence of the decimal numbers, using 16-bit representation and appropriate number system :

$$(48)_{10} - (58)_{10}$$

$$- (32)_{10} - (16)_{10}$$

How are overflow and underflow detected ?

(*b*) How is an array defined in computer science ? Give its one main advantage and *one* disadvantage. Give syntax for the same in C language.

(*c*) Give the list of protocols used by Medium Access (Control) Layer (MAC). What are the functions performed by MAC ?

(*d*) Write the steps for designing a sequential circuit, in general.

(*e*) What are asymptotic notations used for finding time complexity of algorithms ? Define each.

(*f*) What do you mean by deadlock ? What are the four conditions to achieve deadlock ? Explain each briefly.

2. (*a*) What do you mean by programming paradigms ? What are various programming paradigms of programming languages ?

(*b*) Solve the following in Boolean Logic and draw logic circuit :

CD \ AB	00	01	11	10
00	0	1	0	0
01	0	1	0	0
11	1	1	1	1
10	1	1	1	1

(*c*) Explain briefly TCP/IP protocols. What are the different layers of TCP/IP model ? Explain each layer briefly.

(*d*) Construct a binary search tree for the following data arriving in the given order :

15, 7, 22, 10, 8, 17, 3, 5, 22, 23

(*e*) Explain paged memory management system.

3. (*a*) Explain Von-Neumann architecture of stored program organisation.

(*b*) What do you mean by a 'function' in a programming language ? How is it used in a program ?

(*c*) Explain UDP protocol. Compare it with TCP.

(*d*) Design a sequential circuit using the following table :

Load	Clear	Output (D)
0	0	No change
0	1	0
1	×	Input bit

What is the function performed by the circuit.

(*e*) Write a recursive tree traversal algorithm for a binary search tree. Modify the algorithm to count the number of nodes of a binary search tree.

4. (*a*) What do you mean by DMA ? Give a design of typical DMA controller and explain its working.

(*b*) What type of algorithm is Quick-Sort algorithm ? Write a pseudocode for Quick-Sort algorithm taking last element of the list to be sorted as pivot element for partitioning the list.

(c) Draw a block diagram of 3-bit binary up counter, giving the procedure for designing binary up counter.

(d) What are various layers of a compiler ? Explain each briefly.

(e) What are the various passive attacks on a network ? Explain each briefly.

PART–II

5. (a) What do you mean by normalization of a database ? Why do we do normalization of a database ?

(b) Describe Phong's shading model. What are its advantages over Gourad shading model ?

(c) Let A be a PDA. Define a move relation I_A in the set of IDs of A. What do you mean by reflexive-transitive closure of A ? Given that A = (Q, Σ, Γ, δ, q_0, z_0, F) symbols have their own meaning.

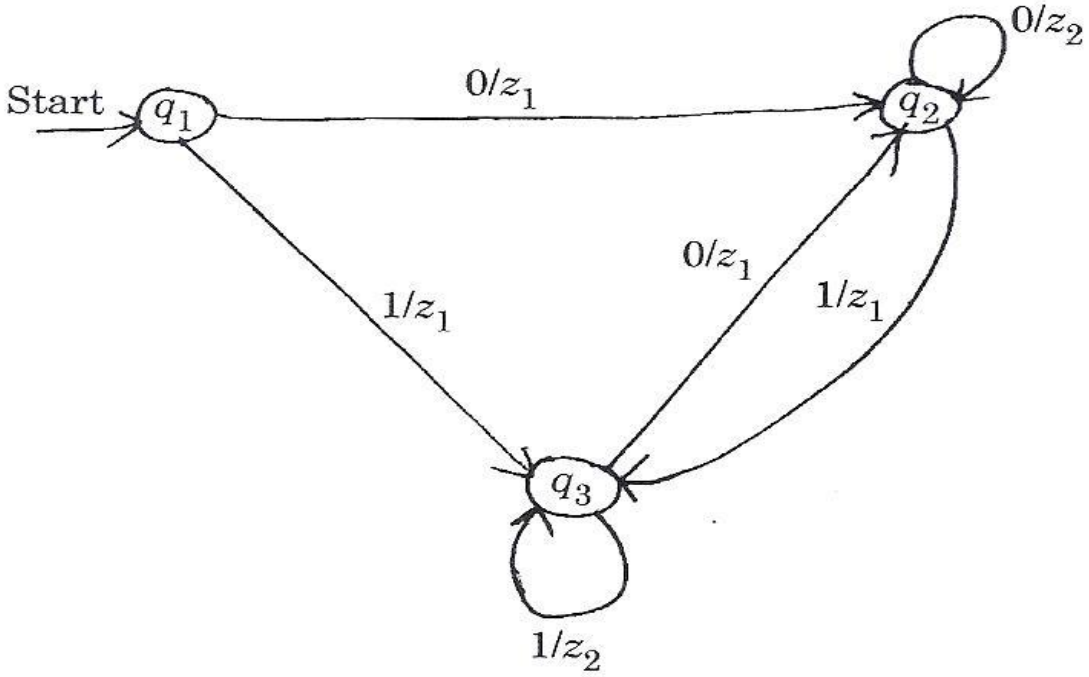
(d) What are the various phases of a compiler ? Explain each briefly.

(e) From the following table of values of x and y, obtain $\frac{dy}{dx}$ for $x = 1.2$:

x	y
1.0	2.7183
1.2	3.3201
1.4	4.0552
1.6	4.9530
1.8	6.0496
2.0	7.3891
2.2	9.0250

(f) What are the various approaches for software testing ?

6. (a) Consider a Mealy machine represented by



Construct a Moore Machine equivalent to this Mealy Machine.

(*b*) What do you mean by LR parsers in compiler design ? Let G be a grammar with start symbol S with production rules

$$S \rightarrow AA$$

$$A \rightarrow aA/b$$

In LR(0) give the (*i*) items, (*ii*) closure operation, (*iii*) GOTO operation for G.

(*c*) Give the modification of the Gauss method, of solving system of linear equations, to compute the inverse of a matrix A.

(*d*) What are the various ways of query optimization in Database system ? Explain each briefly.

(*e*) Write Cohn-Sutherland technique for line clipping in a rectangular region.

7. (*a*) Explain spiral model for software development.

(*b*) Write mid-point line scan conversion algorithm.

(*c*) Give mathematical description of Hill climbing algorithm. What are its variants ?

(*d*) What do you mean by B-tree indexing in database system ? Briefly describe various B-tree indexes.

(*e*) Define CFG and CSG. Give an example of each.

8. (*a*) What do you mean by left recursive grammar ? Write an algorithm to eliminate left recursion in a grammar.

(*b*) Solve the differential equation

$$y' = -y$$

$$y(0) = 1$$

Using Euler's method for finding $y(\cdot 04)$.

(*c*) Define a functional dependency in a database system. What do you mean by a database to be in third normal form ? Give an example of a database in third normal form.

(*d*) What do you mean by homogeneous co-ordinates ? How is it useful in computer graphics ?

(*e*) For the following give the semantic network :

(*i*) I own a brown wooden chair

(*ii*) X gives a book to Y

X and Y are two persons.