

## PGDCA / MCA (I Yr) / BCA

## Term-End Examination

June, 2006

## CS-01 (S) : COMPUTER FUNDAMENTALS

Time : 3 hours

Maximum Marks : 75

**Note :** Question number 1 is **compulsory**. Attempt any **three** questions from the rest. Make suitable assumptions wherever required.

1. (a) Draw the Karnaugh's map for the following function and find the optimal function in sum of products form.
- $$F(x, y, z, w) = \Sigma (0, 2, 7, 8, 9, 11, 15)$$
- Also draw the logic circuit. 5
- (b) What is Flynn's classification ? Can you place a supercomputer in any of the categories defined by Flynn ? Justify your answer. 4
- (c) Write an assembly language program in 8086 to reverse a string of 8 bytes without using a stack. 5
- (d) Design a 3-bit ripple counter. How is this counter different from synchronous counters ? 5

- (e) Explain each of the following instruction types with the help of an illustrative instruction : 6
- (i) Shift
  - (ii) Subroutine call and return
  - (iii) Data transfer
- (f) Explain the concept of instruction pipelining, with the help of a diagram. 5
2. (a) An instruction is stored at location 300 with its address field at location 301. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is 5
- (i) direct
  - (ii) immediate
  - (iii) relative
  - (iv) register indirect
  - (v) index with R1 as the index register
- (b) What is the principle of a single error correction – double error detection code ? What will the size of such a code be for 8-bit data ? 5
- (c) List five differences amongst the following operating system configurations of multiprocessor systems : 5
- \* Master slave
  - \* Separate o/s for each processor
  - \* Distributed

3. (a) Show, with an example, how a subroutine call can be implemented by specifying a location in the subroutine for storing the return address. Also, give a scheme through which parameters can be passed during a subroutine call. 5
- (b) What is interprocessor synchronization ? How is the Mutual exclusion mechanism followed in a Multiprocessor system ? 5
- (c) Construct a JK flip-flop using an RS flip-flop. Explain your circuit. 5
4. (a) How is DMA different from Programmed Input/Output ? How are devices, like the keyboard, connected to a computer ? 5
- (b) What are the micro-operations required for fetching an instruction ? Does the size of instruction change the sequence of micro-operations for fetching the instruction ? Justify your answer. 5
- (c) What are the basic requirements of an Interrupt Servicing Program ? Write the steps required for writing a memory resident Interrupt Servicing Program for the 8086 microprocessor. 5

5. (a) What are the problems of handling large matrices using a uniprocessor system ? What are the additional hardware components that can help in matrix manipulation ? 5
- (b) Draw the logic circuit of the cell of RAM. Construct a 4-bit RAM having 2 words, using this cell. 5
- (c) Write a program in 8086 assembly language that compares two strings available in the data segment. 5

## PGDCA / MCA (I Yr) / BCA

## Term-End Examination

June, 2006

## CS-02 (S) : INTRODUCTION TO SOFTWARE

Time : 2 hours

Maximum Marks : 60

**Note :** Question no. 1 is **compulsory**. Attempt any **three** questions from the rest.

---

---

1. (a) Write an algorithm to find the roots of a given quadratic equation. Also, draw the flowchart for this. 6
- (b) Explain, with an example and using a diagram, the steps to handle page fault in a paged memory management. 6
- (c) Write a shell program that takes a file as the input and counts the number of characters, words and lines in the file. 8
- (d) With the help of a diagram, explain all the phases involved in a waterfall life cycle model. 10

2. (a) List all the important tasks performed during each phase of compiler design. 5
- (b) What is the basic philosophy of the X-Windows system ? How are its components different from those of other GUIs ? 5
3. (a) Explain the desirable characteristics of software product and process. 4
- (b) Using a diagram, explain a demand paging scheme. Also give a suitable example. 6
4. (a) Write a shell script 'Page' that paginates a given file (i.e. to print a fixed number of lines from a file), and then waits for user response before printing the next page of the file on the screen. 5
- (b) Write a regular expression for the following statements of 'C' language : 5
- (i) Assignment
- (ii) Switch
5. (a) Write Unix commands for the following : 5
- (i) To list all the processes running on the system.
- (ii) To display the last 5 lines of a file.

- (iii) To find the occurrences of a given pattern in a file.
  - (iv) To compare the content of two files.
  - (v) To send a message to other terminals.
- (b) What is 4GL ? How is it different from 2GL and 3GL ? List any three 4GL languages with their applications.

5



## PGDCA / MCA (I Yr) / BCA

## Term-End Examination

June, 2006

CS-03 (S) : FILE STRUCTURE AND  
PROGRAMMING IN COBOL

Time : 2 hours

Maximum Marks : 60

**Note :** Question number 1 is **compulsory**. Attempt any **three** questions from the rest.

1. (a) Write a COBOL program to select the mode of mailing and rate for dispatching materials as per the following rules : 10
- (i) If the priority is not high and the weight is less than or equal to 5 kg, despatch the material by ordinary post, and the rate is Rs. 7/- per kg.
  - (ii) If the priority is high, distance is more than 20 kms and the weight is less than or equal to 5 kg, despatch the material by speed post, and the rate is Rs. 13/- per kg.
  - (iii) If the priority is high, distance is less than 20 kms and weight is less than 100 kg, send that with a person, and the rate is Rs. 20/- per kg.

- (b) Write a program in COBOL to compute the monthly gross pay and net pay of the employees of a company, if the attendance, basic pay and deductions like loans, LIC, PF, etc are given. 10

**Note :** Make suitable assumptions, if needed, and mention them.

- (c) Write the record description entries for the following records of the employees : 6

<u>Record position</u>	<u>Data item description</u>
Cols 1 - 25	Name of the Employee
Cols 26 - 27	Unused
Cols 28 - 35	Date of birth (date, month and year 4 digits)
Cols 36 - 37	Unused
Cols 38 - 42	Employee code
Cols 43 - 44	Unused
Cols 45 - 47	Department code
Cols 48 - 49	Unused
Cols 50 - 57	Joining date
Cols 58 - 59	Unused
Cols 60 - 69	Designation
Cols 70 - 71	Unused
Cols 72 - 76	Pay
Cols 77 - 80	Unused

- (d) Define the following items with the initial values as specified : 4

<u>Data Name</u>	<u>Description</u>	<u>Initial value</u>
TOTAL	Numeric, 9 digits with 2 decimal places	0 (zero)
HEADING	Alphabetic, 26 characters	THIS IS A COBOL PROGRAM

2. Write a COBOL program to simulate a billing application for a gas agency. 10

**Note :** Make suitable assumptions, if needed, and mention them.

3. Suppose each record of a file contains the following fields :

“account\_status”, “amount” and “account\_number”. The account\_number is the key on which the records are to be sorted. The following kinds of editing are required :

- (i) If the value of the account\_status in a record in the input file is equal to zero, the record is to be ignored and should not be selected for sorting.
- (ii) If the amount is equal to zero, the record should not be ignored, but an appropriate message along with the corresponding account\_number is to be displayed.

Write the procedure division for the conditions given above. 10

**Note :** Make suitable assumptions for different files that are to be used, and mention them.

4. Write a program in COBOL to compute the total wages of a worker. The worker record has two fields — RATE and WEEKLY\_HOURS, which contain the normal rate and total hours worked in a week respectively. Also, implement the following conditions : 10
- (i) The worker is paid for overtime hours at a rate which is twice the normal rate.
  - (ii) The hours worked in excess of 48 hours in a week are considered to be overtime hours.
  - (iii) The maximum overtime hours will not exceed 40 hours in a month.
5. Explain the use and format syntax of each of the following COBOL statements/verbs/clauses with the help of an example for each : 10
- (a) REDEFINES
  - (b) AFTER
  - (c) ON SIZE ERROR
  - (d) SEARCH
  - (e) INSPECT .... REPLACING

**PGDCA / MCA (I Yr)**  
**Term-End Examination**  
**June, 2006**

**CS-04 (S) : DATA STRUCTURES THROUGH  
 "C" & "PASCAL"**

Time : 2 hours

Maximum Marks : 60

**Note :** There are **five** questions in this paper. Question No. 1 is **compulsory**. Answer any **three** questions from the rest. All algorithms should be written nearer to 'C' or Pascal Language.

- 
1. (a) Convert the following infix expressions into prefix and postfix : 6
- (i)  $a + b * c - d / (f - g - h)$
- (ii)  $(a + b) * (c - d) / (f - (g - h))$
- (b) Write an algorithm to convert a number (base 10) to an equivalent number (base 2), using stack. Use this algorithm to convert  $49_{10}$ . 7
- (c) Write a **function** that searches a given element in an already sorted array, using the Binary search technique. 5

- (d) Consider the following graph stored as an adjacency matrix, where the values given are the weights of the edges. The weight is 100 if the corresponding edge does not exist.

8

	A	B	C	D	E	F
A	0	2	100	100	100	3
B	2	0	2	2	4	100
C	100	2	0	100	3	100
D	100	2	100	0	4	3
E	100	4	3	4	0	3
F	3	100	100	3	3	0

- (i) Draw the corresponding graph.
- (ii) Find the shortest path from A to E, showing all the steps involved.
- (e) Distinguish between "recursion" and "iteration" as methods of repetitive computation. Explain both with an example.

4

2. Suppose a teacher wants to store the name and roll number of each student, along with their marks in Mathematics and Computer Science. The number of students may vary from year to year.

10

- (i) Provide an appropriate data structure for storing the data above.

- (ii) Write a function to print the name of the student who has the highest total marks.
- (iii) Write a function to compute the average marks in Mathematics as obtained by each student. Assume that the number of students is not known initially.
3. (a) (i) Write an appropriate type declaration in C for implementing a binary tree.
- (ii) Write a function that uses the type declaration above to find the height of a binary tree. 5
- (b) What is a B-tree ? Draw a B-tree of order 5 with the following sequence of numbers as input :  
4, 8, 11, 26, 2, 16, 17, 5, 1, 9  
showing all the steps involved. 5
4. (a) How do you represent a sparse matrix in C ? Explain this with the help of an example. Write an algorithm to subtract two sparse matrices using this representation. 6
- (b) Explain, with examples, any two different file opening modes available in C. 4
5. (a) Write an algorithm for sorting a given list of numbers using Quicksort. Explain the algorithm with the help of an example. 6
- (b) Write any two applications of a linked list. 2
- (c) Differentiate between a graph and a tree. 2



## PGDCA / MCA (I Yr)

## Term-End Examination

June, 2006

CS-05 (S) : ELEMENTS OF SYSTEMS  
ANALYSIS & DESIGN

Time : 3 hours

Maximum Marks : 75

**Note :** Question no. 1 is **compulsory**. Answer any **three** questions from the rest.

---

---

1. (a) Explain the types of feasibility study. Also give an example of each. 6
- (b) List three features common to all types of File Organisations. Also, list three other features that are specific to each type of FO. Explain how these features vary in each type of FO. 6
- (c) Write two goals each of recovery testing and user acceptance testing. 4
- (d) List and justify four qualities of a good system analyst. Give two reasons why a system analyst should be involved with any project. 6

- (e) Define the following terms : 5
- (i) EDP
  - (ii) MIS
  - (iii) DSS
  - (iv) EIS
  - (v) KBS
- (f) Explain what an influence diagram is, and its purpose. 3
2. (a) What is the purpose of a DFD ? Design a DFD for a Library Management System upto level 2. 7
- (b) Explain the levels of quality assurance, with an example of each. 6
- (c) Define the term "system reliability". Also give an example of an *unreliable* system. 2
3. (a) Explain what an audit trail is, and its significance. 2
- (b) What is the need of testing in a system development life cycle ? Explain five testing techniques. 7
- (c) Why do we require documentation ? Mention four software design and documentation tools. Also give one purpose of each tool. 6
4. (a) Write two features of each of the database models. Also give two application areas of each model. 9
- (b) What are the different types of system maintenance ? Explain them briefly. 3

- (c) Explain the following terms, in the context of multimedia : 3
- (i) Bitmap image
  - (ii) Morphing
  - (iii) Animation
5. (a) Define Ergonomics. Give two objectives of it. 3
- (b) Develop an analysis and design document for an IGNOU Study Centre management system. Make necessary assumptions. 8
- (c) Define any four basic elements in System Analysis. 4



**PGDCA / MCA (I Yr)**  
**Term-End Examination**  
**June, 2006**

**CS-06 (S) : DATABASE MANAGEMENT  
SYSTEM**

Time : 3 hours

Maximum Marks : 75

**Note :** Question no. 1 is **compulsory**. Attempt any **three** questions from the rest.

- 
- 
1. (a) List any five tasks of a database manager. 5
- (b) Explain aggregation and specialization, with the help of a suitable example for each. 5
- (c) How is insertion performed in a binary tree ? Show the operation on following data elements :  
( 5, 0, 6, 11, 7, 8 ) 5
- (d) Explain the following Relational Algebraic operations : 5
- (i) Projection
- (ii) Selection
- Also give an example for each.
- (e) What is the purpose of SQL statements ? List any two statements for each of the DCL, DDL, DML and TCL category of SQL statements. 10

2. (a) Explain the method of converting a hierarchical database model to a relational model. Take an example of a 4-level hierarchical structure for explanation. 8
- (b) Explain the concept of a distributed computing environment. Name its major components and explain their functioning. 7
3. (a) Draw an ER diagram for an insurance company covering the following aspects : 10
- (i) Policies available
  - (ii) Applying for a new policy
  - (iii) Claiming the amount
  - (iv) Renewal
- Clearly indicate the entities, attributes, relationship and the key constraints.
- (b) With the help of a diagram explain the basic client server computing paradigm. 5
4. (a) Explain 9 rules to qualify a database product as relational DBMS. 9
- (b) Explain the functioning of the following predicates with the help of a suitable example : 6
- (i) Comparison predicate
  - (ii) IN predicate
  - (iii) Quantified predicate

5. (a) What is functional dependency ? Make a dependency diagram for the relation "student". The data related with the student is roll no, name, address, department, year of study. 7
- (b) What is the purpose of normalization ? Reduce any unnormalized table to 1NF, 2NF and 3NF. 8



**ADCA / MCA (II Yr)**  
**Term-End Examination**  
**June, 2006**

**CS-07 (S) : DISCRETE MATHEMATICS**

Time : 3 hours

Maximum Marks : 75

**Note :** Question number 1 is **compulsory**. Attempt any **three** questions from the rest.

1. (a) For the following formula find the corresponding disjunctive normal form : 4

$$(\neg X \vee Y) \wedge (X \vee \neg Y) \wedge (\neg X \vee \neg Y)$$

- (b) In a firm 40 persons work in an office, 80 persons work in the factory. If 30 persons work in both, then find the following using a Venn diagram and set operations. 4

- (i) The number of persons working in an office only.
- (ii) The number of persons working in a factory only.
- (iii) The total number of workers.

(c) For the following partition

$$\{\{1, 2\} \{3, 4, 5\}\}$$

of the set  $A = \{1, 2, 3, 4, 5\}$ , find the corresponding equivalence relation  $R$ .

4

(d) Fill the missing terms in the table.

2

P	Q	$P \Rightarrow Q$	$P \Leftrightarrow Q$	$\neg P \wedge Q$
0	0	—	—	—
0	1	—	—	—
1	0	—	—	—
1	1	—	—	—

(e) Write the signed magnitude, one's complement, and two's complement form of  $(-17)$ . Which of these representations, in general, is more suitable in the implementation of ALU, and why?

6

(f) Find the binary tree corresponding to the expression  $(3y + 7z)(xz - 4z)$ .

3

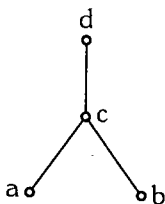
(g) For the following adjacency matrix construct the corresponding graph :

4

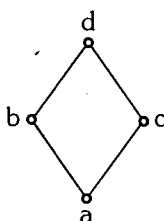
$$\begin{bmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 2 & 1 & 0 \\ 0 & 2 & 2 & 2 & 0 \\ 1 & 1 & 2 & 1 & 1 \\ 1 & 0 & 0 & 1 & 0 \end{bmatrix}$$

- (h) Which of the following are lattices ? Give reasons for each answer.

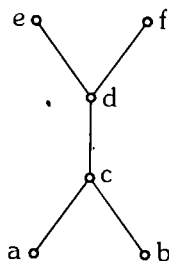
3



(i)



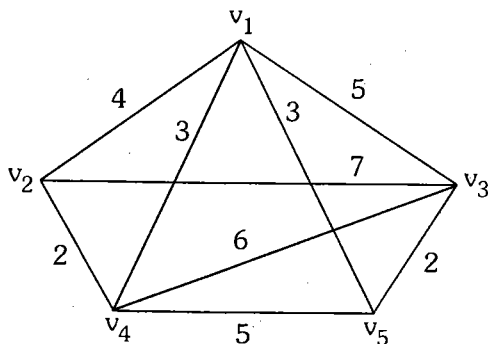
(ii)



(iii)

2. (a) Use Kruskal's algorithm to find the minimum spanning tree for the following graph :

6



- (b) Let  $L = D(20)$  be a lattice under divisibility. Make  $D(20)$  lattice and make its sublattices.
- (c) Let  $f : \mathbf{R} \rightarrow \mathbf{R}$  be a function such that  $f(x) = 2x$ . Check if  $f$  is

4

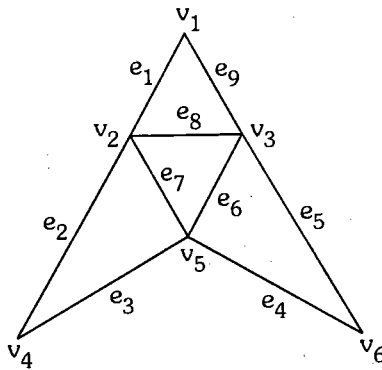
- (i) one-one  
(ii) onto

( $\mathbf{R}$  is the set of real numbers)

3

- (d) Give an example of an argument which illustrates modus ponens. 2

3. (a) Use Fleury's algorithm to find out the Euler's circuit in the following graph : 6



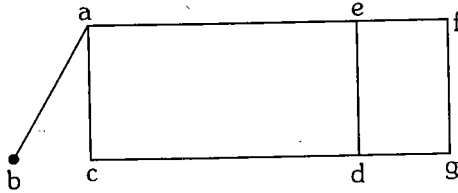
- (b) Minimise the following boolean expression using Karnaugh map : 4

$$X = abc + \bar{a}bc + a\bar{b}\bar{c} + a\bar{b}c$$

- (c) Use the rules of inference to check the consistency of the following argument. At each stage mention the rule that you are applying.

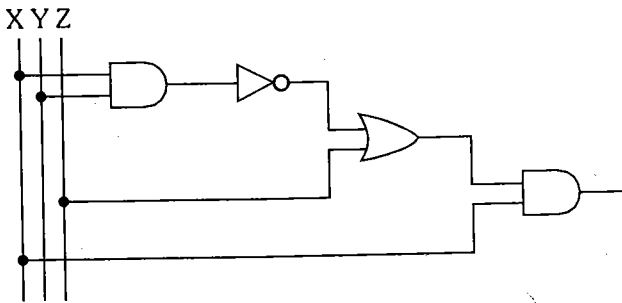
*It is not sunny this afternoon and it is colder than yesterday. We will go swimming only if it is sunny. If we do not go swimming, then we will take a boat trip. If we take a boat trip, then we will be home by sunset. Therefore, we will be home by sunset.* 5

4. (a) Make a finite state machine, which accepts all the strings ending with 00, over the alphabet  $\Sigma = \{0, 1\}$ . 5
- (b) Convert the following graph to a complete bipartite graph by redrawing it. 4



- (c) Write the following statements using predicate logic : 4
- (i) Some birds cannot fly.
- (ii) There exist even prime integers.
- (iii) Each rectangle is a parallelogram.
- (iv) Some rectangles are squares.
- (d) Find the maximum possible domain and range of the function  $f$ , defined by  $f(x) = \frac{1}{\sqrt{x+2}}$ . 2

5. (a) Find the output of following gating network : 4



- (b) Given a matrix, what are the properties it must satisfy if it represents : 5
- (i) a reflexive relation ?
  - (ii) a symmetric relation ?
  - (iii) an asymmetric relation ?
- (c) Define an  $i-v$  fuzzy set, and give an example. 3
- (d) Prove that  $\{\wedge, \neg\}$  is functionally complete. 3

**ADCA / MCA (II Year)**  
**Term-End Examination**  
**June, 2006**

**CS-08 (S) : NUMERICAL & STATISTICAL  
 COMPUTING**

Time : 3 hours

Maximum Marks : 75

**Note :** Question 1 is **compulsory**. Answer any **three** questions from the rest. Use of calculators is **not** allowed.

1. (a) Write a FORTRAN 90 statement for each of the following :

3

(i)  $v = 1.74 \sqrt{gD(\rho_s - \rho) / \rho}$

(ii)  $\text{Kappa} = \sin^3(x) \cos(2y) + 3 \sqrt{\cos(x)}$

(iii)  $\text{efficiency} = \frac{100(1 - \mu s)}{s + \mu}$

(b) Which of the following are acceptable integer variable names ? Give reasons for your answers. 4

(i) APPOLO

(ii) LXY\*Z

(iii) XY/Z

(iv) JNU

(c) Given two variables B, and C, write a program to interchange their values. 3

(d) Write a FORTRAN program to compute force F for given 100 sets of values, where you enter G,  $m_1$ ,  $m_2$  and r from the keyboard. The Newton's law of gravitation is given by

$$F = G \frac{m_1 m_2}{r^2}$$

3

(e) (i) What will be the output of the following sequence ?

M = 1

N = 5

L = 2

DO 60 J = 1,3

L = L+1

N = J+N

60 M = (N \* L + J) \* M

PRINT \*, M

(ii) What will be printed by the following program ?

```
PROGRAM VYAS
IMPLICIT NONE
REAL a, b, P, Q, R
INTEGER X, Y
a = 4.5
b = 3.5
P = (a+b)**2
Q = (a - b)**2
R = P/Q
X = a+b
Y = a * b * R
PRINT*, P,Q,R
PRINT*, X,Y
STOP
END
```

2+2=4

(f) A machine contains a component C that is vital to its operation. The reliability of component C is 80%. To improve the reliability of a machine, a similar component is used in parallel to form a system S. The machine will work provided that one of these components functions correctly. Calculate the reliability of the system S.

3

(g) Find the regression line of y on x for the data :

5

x	1	4	2	3	5
y	3	1	2	5	4