MCA (Revised)

Term-End Examination

December, 2005

MCS-011 Ⓢ : PROBLEM SOLVING AND PROGRAMMING

Time : 3 hours *Maximum Marks : 100*

(Weightage 75%)

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

1. (a) Write an algorithm and draw a corresponding flow chart to print the sum of the digits of a given number. *10*

(b) Write a recursive program to find the G.C.D. of the two given numbers. *10*

(c) Write a program in 'C' to print the following format : *10*

```
I
I G
I G N
I G N O
I G N O U
I G N O
I G N
I G
I
```

(d) Write a program in 'C' to add the given number of days to the current date and print the (final) resultant date. [for e.g. adding 12 days to 22/08/2005 will result in 03/09/2005] *10*

2. (a) Write a program in 'C' to find all Armstrong numbers in the range of 0 and 999. *10*

Hint : An Armstrong number is an integer whose sum of the cubes of its digits is equal to the number itself.

(b) Write a program to count the number of vowels, consonants and spaces in a given string. 10

3. (a) Explain the important features of 'C' language. Mention the types of applications which can be developed using 'C'. List any three 'C' compilers. 10

(b) Write a program in 'C' to perform multiplication of two matrices A and B. *10*

4. (a) *There are 10 records in a file with the following structure.*

```
Struct {
        Char itemcode [6];
        Char itemname [20];
          int qty;
      } item;
```

Write a program to read these records and arrange them in ascending order with respect to qty. *10*

(b) Write the functions to perform the following : *10*

(i) To find m^n where $m, n \geq 0$

(ii) To swap two variables

5. (a) Write a program in 'C' to find and display the minimum and maximum values of an array of integers. *5*

Note : *You should use "pointers" concept only.*

(b) Write the syntax and explain the purpose of the following functions : *6*

(i) Fseek( )

(ii) Fclose( )

(iii) Fprintf( )

(c) Write a symbolic constant or a macro definition for each of the following : 9

(i) Define a macro called AREA, which will calculate area of circle in terms of radius. Use the constant PI in calculation.

(ii) Rewrite the macro described in preceding problem so that radius is expressed as an argument.

(iii) Write a macro called "MAX" that utilizers conditional operator (?:) to determine maximum of 'a' and 'b', two integers.

MCA (Revised)

Term-End Examination

December, 2005

MCS-012 Ⓢ : COMPUTER ORGANISATION & ASSEMBLY LANGUAGE PROGRAMMING

Time : 3 hours *Maximum Marks : 100*

(Weightage 75%)

Note : *Question no. 1 is* ***compulsory*** *and carries 40 marks. Attempt any* ***three*** *questions from the rest.*

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1. (a) Simplify the following boolean function in POS form using K-maps :

$F(A, B, C, D) = \Sigma(0, 2, 4, 5, 6, 8, 10, 13, 15)$

Also draw a logic diagram using only NAND gates. 5

(b) Assume a computer having 64 word RAM and cache memory of 8 blocks. Where can we find the main memory location 26 in cache if

(i) associative mapping is used;

(ii) direct mapping is used;

(iii) 2-way set associative (2 blocks per set) mapping is used.

Assume 1 word = 16 bits and block size = 32 bits. Make suitable assumptions, if any. *10*

(c) An instruction is stored at location 500 with its address field at location 501. The address field has the value 300. A processor register R1 contains the number 100. Evaluate the effective address if the addressing mode of the instruction is

(i) Direct

(ii) Relative

(iii) Register indirect

(iv) Index with R1 as index register

Make suitable assumptions, if any. 6

(d) Represent the following numbers in IEEE-754 floating point single precision number format :

(i) 1011·1001

(ii) — 0·0011001 4

(e) Explain the micro-instruction encoding methods with the help of suitable diagrams. If a machine has a very large number of instructions and registers, which of the two encoding methods is preferred ? Justify your answer. 10

(f) Find out the errors, if any, in the following, and correct it : 5

(i) CMP AX, BX

(ii) IDIV AX, CH

(iii) DEC AL

(iv) AAA AX, BX

(v) XGGH WORD1, WORD2

2. (a) Design a decade counter using D-flip-flop. Show all the steps involved. 10

(b) What is an interrupt ? Explain each of the conditions under which an interrupt occurs. 5

(c) Explain the working of the instruction pipelining, with the help of a diagram. 5

3. (a) Represent the number $(-26{\cdot}5)_{10}$ as a floating point binary number with 24 bits. The normalized fraction mantissa has 16 bits and the exponent has 8 bits. Make and state suitable assumptions, if any. 5

(b) In RAID levels, explain the features of those levels which have poor I/O request rate (read/write). 5

(c) Register A holds the 8-bits 11011001. Determine the B operand and the logic micro-operation to be performed in order to change the value in A to :

(i) 01101101

(ii) 11111101 5

(d) Write an assembly program to convert a 4-digit BCD number to its binary equivalent. 5

4. (a) Construct a 16-to-1-line multiplexer with two 8-to-1 line multiplexers and one 2-to-1 line multiplexer. Make suitable assumptions, if any. 5

(b) What is cache memory ?

A two-way set-associative cache memory uses blocks of four words. The cache can accommodate a total of 2048 words from the main memory. The main memory size is 128 K × 32. What are the sizes of the following :

(i) TAG

(ii) INDEX

(iii) Data

(iv) Cache Memory 5

(c) Write a program in 8086 assembly language to find whether two strings are of equal length. You can assume that the strings are stored in the main memory and a string is terminated by a $ character. 5

(d) A computer has 32 registers, ALU has 64 operations. All are connected to a common bus system. Formulate a control word for the computer, specify the bits in each field of the control words. 5

5. Explain the following with the help of a suitable diagram or an example : *20*

(i) Error detection and correction process

(ii) Any two characteristics of video cards/adapters

(iii) Evaluation stack architecture

(iv) Parameter passing using stack in 8086 assembly language

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Term-End Examination

December, 2005

MCS-013 Ⓢ : DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

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

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1. (a) Let P = You can use the IGNOU computer laboratory,

Q = You are a computer science student of IGNOU, and

R = You are a first year student of IGNOU.

Express the following statement using P, Q, and R and logical connectives.

"You can use the IGNOU computer laboratory only if you are a computer science student of IGNOU and you are not a first year student of IGNOU."

Also write the converse of this statement in words. *4*

(b) Draw the circuit for the boolean expression

$((x \wedge y)' \vee (x' \wedge z) \vee (y \wedge z))$ *4*

(c) Prove that $p \rightarrow q \equiv \sim p \vee q$. *4*

(d) How many one-one functions are there from an n-element set to an m-element set ($n < m$) ? Justify your answer. 4

(e) What is the probability that when two dice are rolled, the sum of the numbers that appear on the dice is 5 or 7 ? 4

2. (a) Let $f(x) = \sin x$ define a function f from the set of real numbers to the set of real numbers. Determine whether f is one-to-one and/or onto. 2

(b) Construct a relation R on $A = \{1, 2, 3, 4\}$ such that R is reflexive and transitive but not symmetric. 3

(c) If a four-digit number is chosen at random, what is the probability that the product of the digits is 12 ? 5

3. (a) How many integers between 1 and 300 (both inclusive) are divisible by at least one of 3, 5, 7 ? 5

(b) Prove that $\sqrt{2}$ is an irrational number. 5

4. (a) Let A = set of odd natural numbers, and
B = set of all prime natural numbers.

(i) Write A and B using set-builder form.

(ii) Check whether any of the inclusions $A \subseteq B$ or $B \subseteq A$ holds.

(iii) What is $B \sim A$? 5

(b) Prove that $\sim(p \vee q) \vee [(\sim p) \wedge q] \vee p$ is a tautology. 5

5. (a) Let $f : B^2 \to B$ be a function which is defined by

$$f(0, 0) = 1, \; f(1, 0) = 0,$$

$$f(0, 1) = 0 \text{ and } f(1, 1) = 1.$$

Find the Boolean expression specifying the function f. *4*

(b) What is the coefficient of $x^7y^2z^2$ in the expansion of $(x + y + z)^{11}$? *3*

(c) Find the dual of *3*

(i) $(x \wedge y) \vee (\sim z) \wedge (p \to q)$

(ii) $(p \to q) \wedge (q \to p) \vee R$

MCA (Revised)

Term-End Examination

December, 2005

MCS-014 Ⓢ : SYSTEMS ANALYSIS AND DESIGN

Time : 3 hours *Maximum Marks : 100*

(Weightage 75%)

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

1. (a) Define the term 'Information System'. List at least five characteristics of a system. Explain real time systems and distributed systems. *10*

(b) List at least 4 rules for naming tables and fields. The list should also include at least 6 properties of database fields that are to be set while designing them. *10*

(c) Differentiate between the following pairs : 20

(i) Batch processing and Online transaction processing

(ii) Decision support system and Expert system

(iii) Alpha testing and Beta testing

(iv) Analysis and Design

2. Suppose you are a project manager. You are required to develop S/W for a Hotel Management System. Write the solution of this problem in the following way : 20

- Scope
- Data dictionary
- Input/Output design
- DFD (upto at least 3 levels)

3. (a) Explain the roles of the various participants involved in Joint Application Development. 10

(b) Define coupling, and explain the following types of coupling : 10

- Data coupling
- Stamp coupling
- Control coupling

4. (a) What is an object oriented CASE tool ? List five types of CASE tools, and four features of CASE based development. *10*

(b) Explain Indexed Sequential and Hashed File organizations. *10*

5. (a) What is a decision support system ? Explain the components of a Decision Support System with the help of a diagram. *10*

(b) What is an Audit software ? Explain any two commercial audit softwares. Also list four benefits of audit. *10*

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MCS-015 (S) : COMMUNICATION SKILLS

Time : 2 hours *Maximum Marks : 50*

Note : *Answer all questions.*

1. Read the following passage and answer the questions given after it :

You don't have to be a special kind of person to sell a product. But although successful salespeople often have special talents and an outgoing personality, the skills they employ are used by us all : we build and maintain relationships with different kinds of people, we listen to and take note of what they tell us and don't just enjoy the sound of our own voices, and we explain things to them or discuss ideas with them.

A firm may depend on their own sales team and/or on the salesmanship of their distributors, wholesalers or retailers. But any company needs to establish a personal

relationship with its major clients (**'key accounts'**) and potential customers (**'prospects'**). It is often said that 'people do business with people' : a firm doesn't just deal impersonally with another firm, but a person in the buying department receives personal visits from people representing the firm's suppliers on a regular basis — or in the case of department stores or chain stores, a team of buyers may travel around visiting suppliers.

Keeping salespeople 'on the road' is much more expensive than employing them to work in the office because much of their time is spent unproductively travelling. Telephone selling may use this time more productively (though in some countries this is illegal), but a face-to-face meeting and discussion is much more effective. Companies involved in the export trade often have a separate export sales force, whose travel and accommodation expenses may be very high. So servicing overseas customers may often be done by phone, fax or letter with not so many personal visits. Many firms appoint an overseas agent or distributor whose own sales force takes over responsibility for selling their products in another country.

A sales department consists of many people who are based in different parts of the country or the world, who don't have the day-to-day contact and opportunities for

communicating with each other that office-based staff have. For this reason, firms hold regular sales conferences where their entire sales force can meet, receive information and ask questions about new products and receive training.

(i) Mention any two skills used by both salespersons and ordinary people during personal/professional interaction. 2

(ii) Given below are three statements based on the passage. Say whether they are true or false. Correct the false statement(s).

(a) A successful salesperson must be an extrovert and a good communicator.

(b) A company need not establish a personal relationship with its prospective clients.

(c) Telephone selling is more expensive than sending salespersons to visit other companies. 3

(iii) What is the advantage that office-based salespersons have over those based in different parts of the country or the world ? 1

(iv) Mention any two reasons why firms hold sales conferences regularly. 2

(v) What does 'servicing overseas customers' mean ? 2

2. *Choose the word or phrase that best completes each sentence from the options given for each :* 5

(i) Individuals should have _____ to information about themselves in record-keeping systems.

(a) approach

(b) access

(c) proximity

(d) reach

(ii) The _____ of data files should take all reasonable precautions for their safety.

(a) caretaker

(b) in-charge

(c) store keeper

(d) custodian

(iii) We shouldn't change the venue of the meeting at such _____ _____ .

(a) small notice

(b) short notice

(c) little information

(d) short information

(iv) No one voted against the motion. The decision was _____ .

(a) anonymous

(b) united

(c) final

(d) unanimous

(v) Her secretary always _____ the phone first.

(a) calls up

(b) looks up

(c) picks up

(d) gets up

3. Complete the customer's part in the following dialogue : *10*

Receptionist : Good morning, sir, how can I help you ?

Customer : _____

Receptionist : I'm afraid Mr. Mehta is not in his room at the moment.

Customer : _____

Receptionist : Sure, sir. His assistant will attend to you in a minute. In the meantime you could please wait in the lounge.

Customer : _____

The assistant : What can I do to help you, Sir ?

Customer : _____

The assistant : I will try and locate Mr. Mehta.

Customer : Thanks very much.

4. Fill in the blanks in the following sentences with a suitable preposition : *10*

(i) The letters we were waiting _____ arrived yesterday.

(ii) You must stay in contact _____ the head office for further instructions.

(iii) We are sending you the material in accordance _____ your request.

(iv) The meeting is going on; the talks are _____ progress.

(v) I heard _____ this vacancy from a friend.

(vi) He was presented _____ a gold watch when he retired.

(vii) I'll wait at the airport _____ the time she arrives.

(viii) The manager will be joining the company _____ Thursday.

(ix) We look forward _____ hearing from you.

(x) Please send a reply _____ email at once.

5. Read the advertisement given below and write a letter applying for the job. Attach your brief bio-data. *15*

Sales Executives
for a
Leading Multinational Company
(based in Delhi)

We are looking for excellent salespersons with initiative and drive for selling our full range of Consumer Durable Products.

Experience of selling similar products is desirable.

Remuneration will be linked to performance.

Apply to Ms. Suchita Kaul

Personnel Executive

ABC Co.

P.O. Box : 1234

MCA (Revised)

Term-End Examination

December, 2005

MCS-021 Ⓢ : DATA AND FILE STRUCTURES

Time : 3 hours *Maximum Marks : 100*
(Weightage 75%)

Note : *Question number 1 is* ***compulsory****. Attempt any* ***three*** *questions from the rest. All algorithms should be written nearer to 'C language.*

---

1. (a) Write an algorithm for the multiplication of two polynomials in one variable. *10*

(b) Define a Queue. Explain the operations that can be performed on a queue. How is a circular queue implemented using arrays ? *10*

(c) Define a "strongly connected component" of a digraph. Write an algorithm for finding strongly connected components of a graph. *10*

(d) Sort the following numbers using Quick Sort :

5, 10, 2, 16, 18, 3, 19, 41, 8

Clearly write all the steps involved in sorting the numbers. *10*

2. (a) Give simplified big-O notation for the following functions : 5

(i) $10n^3 + 6n^2$

(ii) $5n \log n + 30n$

(b) Write an algorithm for the implementation of a stack using linked list. 15

3. (a) Define a Binary Search Tree. Write the process of insertion of a node into a Binary Search Tree. 10

(b) What are the properties of a Red-Black Tree ? How do AA-trees differ from Red-Black Trees ? Give an example each of a Red-Black Tree and an AA-tree. 10

4. (a) Write at least three differences between a Circularly linked list and a Doubly linked list. Write an algorithm for the creation and insertion operations on a Doubly linked list. 10

(b) Write an algorithm for the implementation of a tree using arrays. 10

5. (a) Explain Sequential File Organisation. 5

(b) Write an algorithm for the multiplication of two sparse matrices. 15

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Term-End Examination

December, 2005

MCS-022 Ⓢ : OPERATING SYSTEM CONCEPTS AND NETWORKING MANAGEMENT

Time : 3 hours *Maximum Marks : 100*

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

1. (i) Write a shell script (in Linux) to calculate a factorial of any given number. 7

(ii) How is multimedia operating system different from a conventional operating system ? Elaborate. 5

(iii) What is the basic philosophy of X-Windows ? How is it different from the rest of GUI ? 5

(iv) What are the differences between IP class addresses : A, B, C, D, E ? 5

(v) How will you secure a guest account in Windows 2000 ? 4

(vi) Can more than one person use the same user account on a Linux system ? Discuss. 4

(vii) Discuss the various criteria for selecting a UPS for your system. 6

(viii) List the four computer system vulnerabilities. 4

2. (i) Explain the working scheme and design principles of DNS through appropriate diagrams. 15

(ii) Discuss file management subsystems of Linux. 5

3. (i) What are the goals of computer security ? Discuss the main issues in Windows security management. 15

(ii) Define the essential difference between the following : 5

(a) Spooling

(b) Buffering

4. (i) Briefly describe all the steps in installing the Linux operating system. 15

(ii) What is the need of a firewall ? What are its limitations ? 5

5. (i) Answer the following questions with respect to Windows 2000 :

(a) What is the purpose of distributed file system ? What are its features ? How are the two types of distributed files-roots implemented on Windows 2000 server ? 5

(b) How does a domain differ from a workgroup ? 3

(c) When should security groups be used instead of distribution groups ? 3

(ii) Name any five methods of authentication available in Windows operating system and briefly describe. 5

(iii) Discuss the advantages and disadvantages of Bus and Mesh topologies. 4

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Term-End Examination

December, 2005

MCS-023 Ⓢ : DATABASE MANAGEMENT SYSTEMS

Time : 3 hours *Maximum Marks : 100*

(Weightage 75%)

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

1. (a) Consider the following requirements of a staff management system of an organisation : *8*

- The basic information that needs to be stored about the staff includes staff-id, name, address, date of birth, date of employment, post held.
- It keeps dependent information of employees. An employee can have many dependents.
- Pay details of the employees are also kept.
- It also keeps track of the various departments and employees of those departments.

Draw the E-R diagram for the organisation. Make suitable assumptions, if any.

(b) Consider the following relational scheme :

- student (s_id, name, phone, programme)
- subjects (subject_id, subject_name, taught_by)
- marks (s_id, subject_id, marks)

Make assumptions, if any.

Formulate SQL queries for the following : 15

(i) Find the names of students who have passed more than 5 subjects. (For passing a subject, student must get at least 50 marks)

(ii) Find the programme of the students who have not passed a single course.

(iii) Find the subject that has been passed by all the *students who have appeared for that subject.*

(iv) Find the list of teachers who have taught more courses than what has been taught by teacher 'XYZ'.

(v) Find the s_id of those students who share the same phone numbers. (Assume that a maximum of two students can have the same phone number.)

(c) Assume the following three concurrent transactions : *14*

T1 : Reads A, B and C and writes modified values of B, C and A.

T2 : Read A, C and D and writes modified values of A and C.

T3 : Reads A, B, C and D only and produces a result E.

Write the pseudo code for the transactions above. Show a non-serialisable schedule for the transactions. Construct a precedence graph for the non-serialisable schedule created by you.

(d) Write at least six advantages of the database approach. *3*

2. Consider the following relation :

Examination (student_id, name, subject_code, paper_code, maximum_marks, pass_fail, examination_date, exam_centre_code, marks_obtained_by_student) *20*

(i) Explain at least three anomalies in the relation above.

(ii) Identify the functional dependencies in the relation. Identify the primary key of the relation.

(iii) Normalise the relation to 2NF and 3NF.

(iv) Write the SQL commands for creating the tables. Specify the primary key(s) also.

3. (a) Explain the sequential file organisation with the help of a diagram. Write at least one advantage and one disadvantage of this organisation. 5

(b) Explain the following relational algebraic operations with the help of one example each :

(i) Set Difference

(ii) Division 5

(c) What is an authorisation matrix ? Where is it used ? Explain the use of authorisation matrix with the help of an example. 5

(d) Explain the two phase locking scheme with the help of an example. Why is strict two phase locking needed ? 5

4. (a) Which of the two data structures, binary search tree or B tree, would you use for implementing an index in a database system ? Justify your answer. 4

(b) Explain the inverted file organisation with the help of an example. How do you search on multiple keys using this organisation ? Explain with an example. 8

(c) What are distributed database systems ? List four advantages and six disadvantages. Explain fragmentation in a distributed database system, with the help of an example. 8

5. Explain the following in the context of database systems, with the help of an example each : *20*

(i) Data independence

(ii) Data dictionary

(iii) Issues relating to physical database design

(iv) Three-Tier client-server architecture

(v) Deadlock

MCA (Revised)

Term-End Examination

December, 2005

MCS-023 Ⓢ : DATABASE MANAGEMENT SYSTEMS

Time : 3 hours *Maximum Marks : 100*

(Weightage 75%)

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- Pay details of the employees are also kept.
- It also keeps track of the various departments and employees of those departments.

Draw the E-R diagram for the organisation. Make suitable assumptions, if any.

(b) Consider the following relational scheme :

- student (s_id, name, phone, programme)
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- marks (s_id, subject_id, marks)

Make assumptions, if any.

Formulate SQL queries for the following : *15*

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(c) What are distributed database systems ? List four advantages and six disadvantages. Explain fragmentation in a distributed database system, with the help of an example. 8

5. Explain the following in the context of database systems, with the help of an example each : 20

(i) Data independence

(ii) Data dictionary

(iii) Issues relating to physical database design

(iv) Three-Tier client-server architecture

(v) Deadlock

MCA (Revised)

Term-End Examination

December, 2005

MCS-024 Ⓢ : OBJECT ORIENTED TECHNOLOGIES AND JAVA PROGRAMMING

Time : 3 hours *Maximum Marks : 100*

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

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1. (a) What is a global variable ? Explain two major problems that may occur due to global variables. 5

(b) What is inheritance ? Explain two benefits of inheritance, with an example of each. 5

(c) "One object in Java can be assigned as reference to another object of the same type." To explain this concept write a complete Java program and explain how a reference object works. 5

(d) What is a constructor ? Write a Java program to explain how super class constructors are called in their subclasses. 5

(e) What is multithreading ? Explain this with an example of how interthread communication takes place in Java. 5

(f) Explain how a string class object can be created using an existing 'String Buffer' object. Also, explain how can you find the location of the last occurrence of 'a' in the string "Java Programming". 5

(g) What is a checkbox ? How would you put checkboxes on an applet ? Explain how checkbox group is created in Java. 5

(h) What is a datagram ? Explain how objects of the class DatagramPacket can be created. 5

2. (a) What is an instance variable ? Explain how an instance variable of a class can have different value for each object of that class. 5

(b) What is encapsulation ? Explain how encapsulation provides modularity and information hiding. 5

(c) What is a URL connection ? Write a Java program to explain the processes of reading from and writing to a URL. 5

(d) What is a language paradigm ? Explain two basic features of an object oriented paradigm. 5

3. (a) List four differences between a Java applications program and Java applet program, with an example of each type of program. 8