MCS-011

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 flowchart to search a number in the given list of numbers and also display its position. *10*

   (b) Write a Menu driven program in C to add, subtract and multiply two distances which are given in feet and inches. [e.g. 3 ft 9 inches + 2 ft 5 inches = 6 ft 2 inches] *10*

   (c) Write a recursive program in 'C' to find whether a given five digit number is a palindrome or not. *10*

(d) Write a program in 'C' to print automorphic numbers. The automorphic number is a number in which the square of the number contains the number in the end.

Example : (a) 5 ; 25 (b) 6 ; 36 *10*

2. (a) Design an algorithm and draw corresponding flowchart to find all the prime numbers between two given numbers 'm' and 'n', where m, n > 0. *10*

(b) Design an algorithm and write a program using 'C' to compute transpose of a matrix. *10*

3. (a) Write a program to process the marks for 4 courses in a semester. Each course contains 2 components namely internal assessment and external examination. Students need to pass in both the components individually by acquiring at least 40% in order to declare successful completion in a course. Compute the total marks average and also display the Grade accordingly. *10*

Note : You should use "Structures" concept.

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

(i) To accept a string and print the rightmost "n" characters.

(ii) To accept any two strings and check whether the first string is a substring of the second string.

4. (a) Write a program in 'C' to find the length of a given string including blank spaces, tabs and other special symbols (new line character should be taken as a string terminating character).
Note : You should use "pointers" concept. *10*

(b) Write macros for the following :

(i) To find the value of

$$P(1 + i)^n$$

P, i, n are arguments of a macro and n is an integer. *5*

(ii) To find the maximum of two numbers A, B where A and B are arguments of a macro. *5*

5. (a) Write a program in 'C' to append some characters in an already existing file and also find the number of characters in the resultant file after appending. *10*

(b) Design an algorithm and draw corresponding flowchart to convert a decimal number to its hexadecimal equivalent. *10*

MCS-012

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) Perform the following arithmetic operations using 8-bit registers utilising signed 2's complement representation. Indicate the overflow, if any. 5

(i) 75 + 53

(ii) (— 75) — 53

(iii) (— 53) — (— 13)

(iv) 53 + (— 13)

(b) A digital computer has a memory unit of 64 K × 16 and a cache memory of 1 K words. The cache uses direct mapping with a block size of four words.

(i) How many bits are there in the tag, index, block and word fields of the address format ?

(ii) How many bits are there in each word of cache, and how are they divided ? Include a valid bit.

(iii) How many blocks can the cache accommodate ? Draw suitable diagrams, wherever needed. *7*

(c) What is an assembler ? How does a two-pass assembler work ? *3*

(d) A 36-bit floating point binary number has eight bits plus sign bit for the exponent and 26 bits plus sign bit for mantissa. The mantissa is a normalized fraction. Assume signed magnitude representation for numbers. What are the largest and smallest positive and negative values excluding zero that can be represented using this representation ? Make suitable assumptions, if any. *5*

(e) What is a micro-operation ? How is it different from an instruction of a computer ? Explain the steps of 'instruction fetch' and 'interrupt processing'. *8*

(f) Starting from an initial value of R = 11011011, determine the sequence of binary values in R after a logical shift-left, followed by a circular shift-right, followed by a logical shift-right, followed by a circular shift-left and an arithmetic shift-right operations are performed on the register. Show the value after each operation. 3

(g) *Write a program in 8086 assembly language to add* two single-digit ASCII numbers, stored in CL and BL registers. The result should be in AX register (AL having the value and AH having the carry bit). 4

(h) Simplify the following expression in SOP form using a K-map. 5

$F(A, B, C, D) = \overline{A}\,B + BC + \overline{A}\,\overline{D}$

2. (a) Design a 2-bit count-down counter. This is a sequential circuit with 2 flip-flops and one input x. The state sequence for this counter is

11, 10, 01, 00, 11. 10

(b) In RAID levels, explain the features of those levels which have excellent read request rate. 5

(c) Write a program in assembly language for finding the smallest and largest number in a given set of numbers. 5

3. (a) Construct a 5-to-32 line decoder using four 3-to-8 line decoders with enable and one 2-to-4 line decoder. 5

(b) What is associative memory ? Explain the concept of Match-logic for associative memories. 5

(c) What is FAT ? Calculate the number of entries required in the FAT table, using the following parameters for an MS-DOS system : 5

Disk capacity — 30 MB
Block size — 1024 bytes
Blocks/Clusters — 4

(d) Explain the working of three way instruction pipelining in a RISC system. What are the limitations of this pipeline ? 5

4. (a) Construct and explain the block diagram for a 2-bit adder-subtractor circuit. 5

(b) Explain the memory interleaving technique with the help of a diagram. 5

(c) Explain the working of CD-ROM and DVD-ROM. 5

(d) Explain the working of the Wilkes Control Unit. 5

5. (a) Explain the internal architecture of a DRAM that stores 4 K bytes chip size and uses a square register array. How many address lines will be needed ? Suppose the same configuration exists for an old RAM, then how many address lines will be needed ? *10*

(b) What is the difference between direct and indirect address instructions ? How many memory references are required for each type of instruction to bring an operand into a processor register ? Explain this. *5*

(c) Find the length of a SEC code and a SEC-DED code for a 16-bit word data transfer. *5*

MCS-013

MCA (Revised)

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.*

1. (a) Write the negation of the following statements : *2+2*

(i) For all x, $x^2 < x$.

(ii) There exists x such that $x^2 = 2$.

(b) Construct the circuit that produces the following output :

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

(c) Let A = {1, 2, 3, 4, 5}. Construct a relation R from A to A such that R is reflexive and symmetric but not transitive. *4*

(d) Prove by induction that $n^3 - n$ is divisible by 3 for all positive integers. *4*

(e) Determine all the integer solutions to $x_1 + x_2 + x_3 + x_4 = 9$, where $x_i \geq 1$, i = 1, 2, 3, 4. *4*

2. (a) A sequence of ten bits (0's and 1's) is randomly generated. What is the probability that at least one of the bits is 0 ? 5

(b) Find the number of permutations of the word ATTENDANT. 3

(c) Write the contrapositive of the statement
'If x is a positive real number, there is a number y such that $y^2 = x$.' 2

3. (a) Given five points inside a square whose side has length 2, prove that two are within a distance of $\sqrt{2}$ of each other. 5

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

4. (a) A committee of three individuals decides a proposal. Each individual votes either yes or no. The proposal is passed if it receives at least two yes votes. Design a circuit that determines whether the proposal passes. 5

(b) Find the domain and range of the function $\sqrt{\frac{1+x}{1-x}}$, where x takes real values. 3

(c) State whether the following statement is true or false. Give reasons for your answer. 2

"For any 3 sets A, B and C, and functions
$f : A \rightarrow B$, $g : B \rightarrow C$ such that $g \circ f$ is surjective, then f and g must be surjective."

5. (a) How many boolean functions of n variables are there ? Give reasons for your answer. 4

(b) Check whether the following argument is valid, using a truth table. 6

"If Shalini leaves home before 9.00 AM or if she takes a taxi, she will reach office in time. She did leave after 10.00 AM and she did reach office in time. Therefore, Shalini must have taken a taxi."

MCS-014

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) Briefly describe the phases of a system development life cycle through a diagram. *10*

(b) What is meant by 'Process Specification Tool' ? Describe any two such tools. *10*

(c) What are the inputs to physical database design ? Also, write at least five guidelines for database design. *10*

(d) Briefly explain the four methods of conversion from an existing system to the new system. *10*

2. (a) Define the term 'Documentation' according to ISO/IEC 12207 : 1995. Also define SRS, and explain the structure of a typical SRS document. *10*

(b) Explain any ***two*** of the following : *10*

- Distributed system
- Prototyping
- Real time system

3. (a) Define the term Feasibility Study. Describe at least four types of feasibility analyses. *10*

(b) Explain the six goals of design. Based on the goals, give a set of guidelines for arriving at good design. *10*

4. (a) Define a CASE tool. List three advantages of CASE tools. Explain forward and reverse engineering, with appropriate diagrams. *10*

(b) Explain at least five criteria for form design and report design. *10*

5. (a) What is MIS ? List at least four characteristics of MIS. Explain the architecture of MIS, with a diagram. *10*

(b) Define 'Information System Audit'. List three objectives of Audit. List at least five benefits of Audit. *10*

MCS-015

MCA (Revised)

Term-End Examination

December, 2005

MCS-015 : COMMUNICATION SKILLS

Time : 2 hours *Maximum Marks : 50*

Note : *Answer **all** questions.*

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

Diplomacy, friendliness and co-operation are important in selling. There's a widespread belief, which is probably true, that buyers 'buy from those they like' and that sellers give a better deal to 'those they like'. All salespeople have a certain 'fear', or reverence, for buyers because they have the power to give or to withhold an order. 'Negotiation' is the part of the sales conversation where bargaining about the conditions of an order takes place. It comes at the end of the sales talk at the point when the buyer is definitely interested. Because additional persuasion may be required, it's important not to give away concessions while making the sales presentation.

In international business there are different types of business negotiations, negotiation styles and negotiation situations. A simplified model of what goes on shows four main phases of negotiation :

1 The *preparation phase* : this is where you work out what you want and what your main priorities are.

2 *The debating phase : this is where you try to find* out what the other side or the customer wants. You say what you want but you don't say yet what the *final conditions are. You use open questions and* listen to the customer to try to find out in what areas they may be prepared to move.

3 The *proposal phase* : this is the point at which you suggest some of the things you could trade or which you might theoretically be prepared to trade, offer or concede. Formulate your proposals in the form of *if ..., then ...* . Be patient and listen to the other side's proposals.

4 The *bargaining phase* : this is when you indicate what it is you will actually trade, offer or perhaps concede. In turn you conditionally exchange individual points, along the lines of : 'If you are prepared to pay swiftly, then we are prepared to change our delivery schedules.' Remember to write down the agreement.

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

(a) Diplomacy is the only important thing in selling.

(b) Concessions should be made to the buyer in the beginning of negotiations. 2

(ii) Why are salespeople afraid of their buyers ? 2

(iii) Define 'negotiations' in your own words. 2

(iv) Mention the main differences between the preparation phase and the debating phase. 2

(v) Complete the following sentences with a suitable word from the passage : 2

(a) The bargaining phase indicates what it is that you _____ trade or offer.

(b) One must write down the _____ in the bargaining phase.

2. From the four options given after each sentence, choose the word or phrase that best completes it. 5

(i) Companies must earn a _____ for honesty.

(a) fame

(b) reputation

(c) renown

(d) repute

(ii) He has started a restaurant in Rajouri Garden and wants to _____ the business.

(a) augment

(b) amplify

(c) stretch

(d) expand

(iii) These days the relations are _____ between the director and his assistant.

(a) pressed

(b) stretched

(c) pinched

(d) strained

(iv) A solution to the crisis _____ _____ a combination of tact and consideration.

(a) calls upon

(b) calls up

(c) calls for

(d) calls back

(v) It is important to think of the _____ of this action now.

(a) consequences

(b) effects

(c) influence

(d) impact

3. Complete the following dialogue : *10*

Receptionist : Good morning. May I help you, Madam ?

Visitor : _____

Receptionist : Have you got an appointment with him ?

Visitor : _____

Receptionist : Well, in that case I'll have to check if he is free now.

Visitor : _____

Receptionist : The manager says he'll be free in about fifteen minutes. Why don't you wait in the lounge in the meantime. I'll let you know as soon as he's free.

Visitor : _____

Receptionist : Well, you can have a cold drink in our canteen.

Visitor : _____

Receptionist : You're welcome.

4. Complete the blanks in the following sentences using the verbs given in brackets in their correct form : *10*

Dear Sir

We __1__ (write) to tell you about the reorganisation at Softsys. As you __2__ (know), we __3__ (trade) for four years now and __4__ (establish) a reputation for reliability in the market. This has resulted in increased business, which __5__ (place) a lot of pressure on our organisation. So, we __6__ (change) the structure of Softsys at present so that we can __7__ (continue) to provide the level of service that you, as a valued customer, __8__ (expect).

We __9__ (not plan) any major changes right now; however, we __10__ (review) our roles and responsibilities.

5. Write a letter applying for the position of Team Manager, Marketing Division, New Finances Pvt. Ltd., India. You should enclose your brief bio-data.

The letter should be addressed to Mr. Mangesh Swaminathan, M.D. of the company.

The essential qualifications are M.B.A. with a specialisation *in marketing and one year's experience as a Sales Executive in a company.* *15*

MCS-021

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 addition of two polynomials in one variable. *10*

(b) Define a stack. Explain the operations that can be performed on a stack. How are multiple stacks implemented using arrays ? *10*

(c) Define and give an example of a Minimum Cost Spanning Tree. Write at least two differences between Kruskal's and Prim's Algorithms. *10*

(d) Define a heap. Sort the following numbers using Heap Sort : *10*

2, 3, 81, 64, 4, 25, 36, 16, 9, 49

Clearly write all the steps involved in sorting the numbers.

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

(i) $30\ n^2$

(ii) log n+3n

(b) Define dequeue. Write an algorithm for the implementation of a dequeue using arrays. 15

3. (a) Define a tree, and a binary tree. What are the different ways of traversing a binary tree ? Write an algorithm for any one of the traversal methods. 14

(b) Write an algorithm for the implementation of Binary Search. What are its Space and Time complexities ? 6

4. (a) Define an AVL tree. In case an AVL tree becomes unbalanced, how will you balance it ? Explain with example(s). 15

(b) Explain an Indexed Sequential File Organisation. 5

5. (a) Define a Splay tree. Explain the possible splay rotations. 10

(b) Write an algorithm for the implementation of a Singly Linked List. 10

MCS-022

MCA (Revised)

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****. Answer any* ***three*** *questions from the rest.*

1. (i) Write a shell script (in Linux) that prints all the contents of some existing text file in upper case. 6

(ii) You have taken a back-up of a directory containing several files onto 10 floppies using *tar*. When you try to restore these after a crash, the 5^{th} floppy is found to be corrupted. How much data do you lose ? 4

(iii) How is a database operating system different from a conventional operating system ? Elaborate. 4

(iv) Differentiate between unicasting, broadcasting and multicasting. Give examples of each technique. 6

(v) How does information flow in Internet environment ? Describe all the steps taking place at different layers. 6

(vi) What do you understand by symmetric and asymmetric cryptography ? Give an example for each. 4

(vii) Write the LINUX commands for the following : 5

(a) To display the information about any command.

(b) To sort all the files in alphabetical order in a given directory.

(c) To print the calendar for any given month and year.

(d) To display status of all the processes.

(e) To run any process in the background.

(viii) List all the general functions of any operating system. 5

2. (i) Discuss the difference between microkernel and monolithic architecture. What type of architecture does Windows 2000 O/S support ? Describe its kernel architecture in brief. 15

(ii) List the important Linux directories and briefly describe them. 5

3. (i) Show the abstract model of virtual to physical address mapping and explain. Also describe virtual memory management scheme in Linux. 15

(ii) List any five TCP/IP-related protocols and describe them in brief. 5

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

(a) What is the purpose of Dynamic Host configuration protocol and Window Internet Naming Service ? 6

(b) How does a domain differ from a workgroup ? 4

(ii) Differentiate between LAN and WAN. 5

(iii) What are the two general methods of implementing network security by Firewalls ? Elaborate. 5

5. (i) What is multithreading ? How is it different from a process ? Describe the process and thread management in Linux. 10

(ii) What is the purpose of VPN (Virtual Private Network) ? Name some VPN technologies supported by Windows 2000. 4

(iii) What is Kerberos ? Describe the Kerberos management in Windows operating system. 6

MCS-023

MCA (Revised)

Term-End Examination

December, 2005

MCS-023 : DATABASE MANAGEMENT SYSTEMS

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

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

1. (a) Consider the following requirements of a university database system : *8*

- The university keeps track of its students. It stores the student name, enrolment number, date of birth, phone number, gender and address.
- The university also keeps track of the programmes offered by it. The information that is to be kept about the programme is : programme code, programme name, fee, minimum eligibility and date of start of programme.
- The university has many departments. A programme is associated with only one department. Each department has a location address and name.

- A student can register only for one programme at a time.

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

(b) Consider the following relational scheme : 15

— Books (book_id, b_name, author, purchase_date, cost)

— Members (member_id, m_name, address, phone, birth_date)

— Issue_return (book_id, member_id, issue_date, return_date)

Formulate SQL queries to the following :

(i) Find the names of all those books that have not been issued.

(ii) Display the member_id and the number of books issued to that member. (Assume that if a book in Issue_return relation does not have a return_date, then it is issued.)

(iii) Find the book that has been issued the maximum number of times.

(iv) Display the names and authors of books that have been issued at any time to a member whose member_id is "ab".

(v) List the book_id of those books that have been issued to any member whose date of birth is less than '01-01-1985', but have not been issued to any member having the birth date equal to or greater than '01-01-1985'.

(c) What is data independence in the context of a DBMS ? Explain with the help of an example. 4

(d) List at least four problems of concurrent transactions. Explain each with the help of an example. 6

(e) What is a primary index ? How is it different from secondary index ? Explain them with the help of an example each. Why is secondary index more helpful in increasing the efficiency ? Explain what the help of an example. 7

2. (a) Explain the six limitations of file based systems. How can the problem of data dependence be solved by Database systems ? Explain this with the help of an example. 10

(b) A bank has many branches. A customer can open his/her account in any branch and can operate his/her account from any branch. The information that is stored about the account includes account number, branch, name of the customer, address of customer, guarantors of the customer, account balance.

(i) Suggest a suitable fragmentation scheme for the bank. Give reasons in support of your scheme. 4

(ii) Suggest a suitable replication scheme. Justify your suggestion.

Make suitable assumptions, if any. 2

(c) Write at least two advantages and two disadvantages of data replication. 4

3. Consider the following relation :

UNIVERSITY (student_id, s_name, programme, subject, subject_name, credits, number_of_hrs, date_of_registration_to_programme, maximum_duration_of_programme)

Please note the following points about the database above :

- A student can enrol for many programmes at a time.
- Number_of_hrs per credit is 30.
- A programme may consist of many subjects. One subject belongs to only one programme.

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

(ii) What are the functional dependencies in the relation above ? What is the primary key of the relation ?

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

(iv) Write the SQL commands for creation of tables.

Make suitable assumption, if any. *20*

4. (a) What is a log ? What are its contents ? How can log be used for database recovery ? Explain this with the help of an example. How is a checkpoint useful for log based recovery ? Explain with the help of an example. *10*

(b) Why are multiple access paths needed for database files ? Explain with the help of an example. Explain the multilist file organisation with the help of an example. *10*

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

(i) The three level architecture and its need

(ii) 2 Tier-client server architecture

(iii) Authorisation in databases

(iv) Creation of view

(v) JOIN operation

MCS-024

MCA (Revised)

Term-End Examination

December, 2005

MCS-024 : OBJECT ORIENTED TECHNOLOGIES AND JAVA PROGRAMMING

Time : 3 hours *Maximum Marks : 100*

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

1. (a) What is an object oriented paradigm ? Explain two differences between the object oriented paradigm of programming languages and the structured paradigm of programming languages. 5

(b) What is message passing ? Explain the need of message passing in object oriented programming with an example. 5

(c) What is a constructor ? Write a Java program to explain the need of a constructor in problem solving. 5

(d) Write a program in Java which reads two real numbers, finds the sum of these two numbers and prints the real and imaginary part of this sum separately. 5

(e) What is 'super' in Java ? Explain at least two different uses of 'super' in the Java programs, with an example. 5

(f) Write a program in Java to find whether the size of a given file is less than 50 bytes or not; and if it is less add characters to make it 50 bytes. 5

(f) Explain two situations when String Buffer would be used for string handling. Also write a program which appends the string "programming", to the string "Java". Print the final content of the appended string. 5

(h) What is an event ? Explain different components of an event. 5

2. (a) What is a Servlet ? Explain the use of GET and POST methods. 5

(b) What is method overloading ? What are the important points which should be taken care of while overloading methods ? Write a Java program to explain the working of overloaded methods. 10

(c) What is Border Layout ? Write a Java program which creates Border Layout and adds two text boxes to it. 5

3. (a) Explain the following concepts with an example of each :

(i) Class and Object;

(ii) Inheritance. 6

(b) Find the **errors** in the following Java program, and correct them.

```
Class Examination;
{
public void main (args[ ])
  {
    system.out.println ("Java is an OOL)
    int  i = 10;
    for  (i > 0; i — —)
    system.out.println ("i="i );
    }
    }
    }
```

4

(c) Write a program in Java which finds the number of lines and number of characters in a given file. 5

(d) What are the advantages of 'platform independent languages' ? Also explain how Java is platform independent. 5

4. (a) What is a session ? How does URL rewriting store session details ? Explain this with an example. 8

(b) What is an exception ? Explain, with an example, how exceptions are handled in Java. 5

(c) What is multithreading ? Explain two advantages of multithreaded programs. Write a program in Java to explain how different priorities can be assigned to different threads. 7

5. (a) What is a TCP/IP socket ? Explain the use of a TCP/IP socket through an example of a program written in Java. 7

(b) What is a package ? Explain the different access controls for packages in Java. 5

(c) What is Unicode ? Explain the advantage of using Unicode. 2

(d) Write a program in Java which finds the sum of the two arrays given below,

```
A = 1 2 3 4
    2 3 4
    5 6

B = 4 3 2 1
    3 2 1
    2 1
```

Make necessary assumptions, if any. 6