UNIVERSITY OF DELHI
Department of Computer Science

Bulletin of Information
2011-2012

MCA

M.Sc. (Computer Science)

Dr. Neelima Gupta
Head of the Department

FACULTY MEMBERS
1.	Ms. Vidya Kulkarni	Associate Professor
2.	Mr. P.K. Hazra	Associate Professor
3.	Dr. S.K. Muttoo	Associate Professor
4.	Dr. Naveen Kumar	Associate Professor
5.	Dr. Punam Bedi	Associate Professor
6.	Dr. Vasudha Bhatnagar	Associate Professor

ADMINISTRATIVE STAFF
1.	Mr. Ram Rai Singh Bedi	Office Incharge
2.	Mr. Kanhiya Lal	J.A.C.T.
3.	Ms. Himani Saini	J.A.C.T.
4.	Mr. Rajbir Giri	Office Attendant
5.	Mr. Balkishan	Office Attendant

TECHNICAL STAFF
1.	Ms. Devki Rawat	Technical Assistant
2.	Mr. Nikhil	Technical Assistant
3.	Mr. Banshraj Ram	Laboratory Attendant
4.	Mr. Anand Singh	Laboratory Attendant
5.	Mr. Nishant Beniwal	Laboratory Attendant

Phone : +91-11-27667591, +91-11-27667059; +91 -11 -27667725 Extn. 1336

Fax : +91-11-27662553

Email: office@cs.du.ac.in, head@cs.du.ac.in

Website: http://cs.du.ac.in

INDEX

1.   Introduction:

Established in the year 1922, University of Delhi is one of the most prestigious institutions in India. Since its inception it has been a centre of academic excellence. The Department of Computer Science was established in University of Delhi in the year 1981, with the objective of imparting quality education in the field of Computer Science.

Master of Computer Applications (MCA)

Three-year Master of Computer Applications (MCA) programme at the department was started in 1982 and was among the first such programmes in India. Since then, it has been immensely popular and one of the most sought after courses in India. The department is proud of its more than 700 alumni at important positions in information technology industry in India and abroad.

M.Sc. (Computer Science)

Two-year M.Sc. (Computer Science) course introduced in the year 2004 in the department aims to develop core competence in Computer Science and prepare the students to carry out research and development work, as well as take up a career in the IT industry.

Post-Graduate Diploma in Computer Applications (PGDCA)

The University offers through its constituent colleges, a Post-Graduate Diploma in Computer Applications for providing qualified work force to the industry.

Doctor of Philosophy (Ph.D.)

The department has strong research interests in diverse branches of Computer Science and offers a Doctor of Philosophy (PhD.) programme aimed at producing quality researchers.

Under-graduate Programmes

The university offers a three-year B.Sc. (Honours) Computer Science programme through its constituent Colleges. The programme primarily intends to serve as input for higher degree academic programmes in Computer Science. The programme lays emphasis on building a strong mathematical foundation besides forming a base in computer science; it includes modules on mathematical sciences, electronics and humanities as well. The courses at B.Sc. (Physical Sciences) and B.A. level are oriented towards providing adequate grounds to the students to later select their fields of specialization. These courses also equip the students for entry level jobs in IT industry.

2.   Schedule of Admissions

Master of Computer Applications (MCA)	
Application Forms	To be downloaded from http://cs.du.ac.in
Last date for receipt of Completed Application Forms	**20th June 2011**
Date of Entrance Examination	**MONDAY** 4th July 2011
Date of Interviews	14 – 18 July 2011
Date of Counseling	20th July 2011

M.Sc. (Computer Science)

Application Forms	To be downloaded from http://cs.du.ac.in
Last date for receipt of Completed Application Forms	**20th June 2011**
Date of Entrance Examination	**SUNDAY** 26th June 2011
Date of Counseling	07,14, 20 July 2011

Note:

1) All information relating to admission, including Entrance Examination results, schedule for interviews (applicable for MCA only), and counseling shall be notified on the department website and on the department notice board.

2) The Entrance Examination will be conducted at University of Delhi only.

3.   Eligibility conditions

(A)   Master of Computer Applications (MCA)

(a)   (i) B.Sc. (Honours) Computer Science (10+2+3 scheme) from University of Delhi or any other University whose examination is recognized as equivalent to University of Delhi with 60% marks in aggregate.

(a)   (ii) Any bachelor degree from the University of Delhi with atleast one paper in Mathematical Sciences under annual mode/ atleast two papers in Mathematical Sciences in semester mode or an equivalent degree. Minimum percentage required 60% marks   in aggregate (Relaxation of 5% marks for the candidates belonging to SC/ST categories).

Note: Mathematical Sciences include Mathematics, Computer Science, Operational Research & Statistics
(b) The candidates who are appearing in the final year examinations of the degree on the basis of which admission is sought [as mentioned above in A (a)] are also eligible to apply.

(B)   M.Sc. (Computer Science)

(a) (i)   B.Sc. (Honours) Computer Science (10+2+3 scheme) from University of Delhi or any other University whose examination is recognized as equivalent to University of Delhi with 60% marks in aggregate

   (ii) B.Sc. Applied Physical Sciences with Mathematics and Computer Science / B.Sc.(General) Mathematical Sciences,   (10+2+3 scheme) with Mathematics and Computer Science from University of Delhi or any other University whose examination is recognized as equivalent to University of Delhi. Minimum Percentage required: 60% marks in the aggregate along with 60% marks in Computer Science and Mathematics separately.

  (iii) Any Bachelor's Degree of University of Delhi or an equivalent examinations, with at least six papers in Computer Science and   two papers in Mathematics under Semester system / at least four papers in Computer Science and one paper in Mathematics under Annual Examination System. Minimum Percentage required 60% marks in the aggregate, and 60% marks in Computer Science and Mathematics separately. (Relaxation of 5% marks for the candidates belonging to SC / ST categories for all of the three above)

(b) The candidates who are appearing in the final year examinations of the degree on the basis of which admission is sought [as mentioned above in B (a)] are also eligible to apply.

4.   Age Requirement

(i)   No person shall be eligible for admission to first year of the MCA / M.Sc. (Computer Science) course in the University unless he / she is twenty years of age before the first day of October of the year in which he/she seeks admission.

(ii)   The Vice-Chancellor may relax the age limit up to the extent of one year on individual merit after a written request is made by the candidate.

5.   Reservations

(a)   Seats are reserved for Scheduled Caste, Scheduled Tribe and OBC candidates as per university rules subject to production of certificate as mentioned in 6 (a). A candidate will be considered under OBC category only if his/her caste appears in the central OBC list as notified by University of Delhi.

(b)   5 % of the total number of seats are reserved for (i) The Children or Widows/ Wives of Officers and Men of the Armed Forces including Para Military Personnel killed or disabled in action, (ii) Wives/Widows/

Children of Officers and Men of the armed forces including Para-Military Personnel who died/were disabled while on duty, (iii) Wards of Ex-servicemen personnel and serving personnel of the Defence /Armed Forces and all Police Forces who are in receipt of Gallantory Award, all taken together. Above reservation is subject to production of certificate as mentioned in 6 (b).

(c) 3 % of seats are reserved for the Physically Handicapped candidates, subject to production of a certificate as mentioned in 6 (c).

(d) Foreign students seeking admission in the department and satisfying the eligibility criteria as mentioned in 3, are required to apply through the Dy. Dean (Foreign Students), Foreign Students Registry, c/o Faculty of Management Studies, University of Delhi, Delhi-110007 (India). However, those foreign students who have passed the Bachelor's Degree examination (or are appearing for the same) from an Indian University would be required to appear for the Entrance Examination conducted by the Department of Computer Science. In addition to applying through the Foreign Student's Registry office, these students would also be required to fill up the application form of the Department of Computer Science. On qualifying the Entrance Examination, the admission of the foreign student's will be finalized through the FSR office of University of Delhi. No foreign students will be admitted directly by the Department.

Over and above the normal fee, registration fee and annual fee as applicable from time to time will also be charged from a foreign student seeking admission to the course.

6. Certificates Required for Reserved Categories

A candidate applying for any reserved seat as mentioned in paragraph 5 (a), 5 (b), 5 (c) or 5 (d) is required to submit the following certificate as the case may be:

(a) SC/ST/OBC Certificate : For admission to a seat reserved for 'Scheduled Caste / Scheduled Tribes /Other Backward Classes, attested copy of certificate should be submitted from an approved district authority stating the Scheduled Caste / Schedule Tribe /OBC to which the candidate belongs. A list of approved authorities is given below:

(i) District Magistrate/Additional District Magistrate / Collector / Deputy Collector/Deputy Commissioner/Additional Deputy Commissioner /First Class Stipendiary Magistrate/City Magistrate, not below the rank of First Class Stipendiary Magistrate /Sub-Divisional Magistrate / Taluka Magistrate/ Executive Magistrate/ Extra Assistant Commissioner.

(ii) Chief Presidency Magistrate/Additional Chief Presidency Magistrate/ Presidency Magistrate.

  (iii) Revenue Officer not below the rank of Tehsildar.

  (iv) Sub Divisional Officer of the area where the candidate and / or his/ her family resides.

  (v) Administrator / Secretary to Administration / Development Officer (Lacadive and Minicoy Islands).

(b) Entitlement Card/ Certificate: The candidates under category 5(b) will be required to provide attested photocopy of Entitlement Card/ Certificate from the competent authority.

(c) Certificate for Handicapped Candidates: For admission to a seat reserved for handicapped candidate, the candidates should submit a medical certificate from competent medical authorities in a format as per Govt. of India guidelines along with their application form for Entrance Examination. However, the admission of the physically handicapped candidates shall be subject to their medical examination and appropriate recommendations of the Chief Medical Officer, WUS Health Centre, University of Delhi (Main Campus). The recommendations of the above mentioned authority shall be final for all purposes. Please note that :

  (i) The certificate should not be more than 5 years old.

  (ii) It should be signed by a board of three doctors with legible stamp indicating the name & designation of the doctors.

  (iii) The certificate should be countersigned by CMO/Medical Superintendent /with stamp under the signatures. Certificate should have photograph of the candidate.

  (iv) Diagnosis should be written clearly in the certificate.

The original certificate as mentioned above in (a), (b) and (c) would be required to be produced for verification at the time of admission.

7. Admission Procedure:
MCA

50% of the seats shall be filled on the basis of merit in the B.Sc.(H) Computer Science Examination of University of Delhi. Only those students who have secured at least 60% marks in the B.Sc.(H) Computer Science examination of the University of Delhi are eligible for consideration under this category. The candidates interested to apply for admission in this category, must apply along with application processing fee by the deadline mentioned in this document. No separate advertisement shall be issued for this purpose.

Remaining 50% seats shall be filled through an entrance examination conducted by the Department of Computer Science followed by interview. The entrance exam will consist of two parts:

Test I : Objective type questions.
Test II : Comprehensive questions

Note: If M is the number of seats in a particular category, answer sheets of Part II shall be evaluated only for the top 6M scorers of Part I in that category and top 3M scorers of Part II shall be called for the interview. There shall be 80% weight-age for the entrance exam (only Part II) and 20% weight-age for the interview.

M.Sc.

50% of the seats shall be filled on the basis of merit in the B.Sc.(H) Computer Science Examinations of University of Delhi. Only those students who have secured at least 60% marks in the B.Sc.(H) Computer Science examination of the University of Delhi are eligible for consideration under this category. The candidates interested to apply for admission under this category, must apply along with application processing fee by the deadline mentioned in this document. No separate advertisement shall be issued for this purpose.

Remaining 50% seats shall be filled through an entrance examination conducted by the Department of Computer Science. The entrance exam will consist of two parts:

Test I : Objective type questions.
Test II : Comprehensive questions.

Note: If M is the number of seats in a particular category, answer sheets of Test II shall be evaluated only for the top 4M scorers of Test I in that category. Merit shall be prepared on the basis of scores in Test II only.

8.   Course Structure

For details of course structure and scheme of examination please visit

http://cs.du.ac.in

9. Application Fee for

MCA / M.Sc. (Computer Science)	Rs. 800 for General Category
	Rs. 400 for SC / ST / PH Category
Mode of Payment	Payment should be made by crossed Bank Draft only in favour of **"Registrar, University of Delhi"** payable at New Delhi

Note: **The Department will not be responsible for non-delivery or delayed delivery of the form sent by post.**

10. Course Fee for MCA / M.Sc. (Computer Science)

A course fee of Rs. 7000/- per semester shall be charged over and above the normal University fee.

11. Number of Seats for MCA / M.Sc. (Computer Science)

The number of sanctioned seats is 46. Reservation for seats under categories 5(b), (c) and (d) are super numeracy.

Distribution of 23 seats under each of the two categories (i) based on Merit in B.Sc,(H) Computer Science examination of University of Delhi (ii) Entrance Examination (in case of M.Sc.) and Entrance Examination + Interviews (in case of MCA) is as follows:

SC	3
ST	2
OBC	6
Unreserved	12
Total	23

12. Admission Ticket for MCA / M.Sc. (Computer Science)

The admission tickets will be issued by post only. In case of non-receipt of the Admission Ticket, a request may be made to the department with   two copies of photograph alongwith proof of having sent the application, not earlier than three days prior to the date of the Entrance Examination, for issue of a duplicate admission ticket. The candidate will be required to show the admission ticket at the time of the test. No candidate will be admitted to the Examination Hall without the admission ticket.

13. Fee Concession for MCA / M.Sc. (Computer Science)

Upto 25 % of total enrolment of the women students and 20% of the men students may be allowed fee concession.

14. Hostel Accommodation

Limited hostel accommodation is available for MCA/M.Sc. students on the campus. Students should directly contact the following University Hostels for accommodation:

For men:

1. Gwyer Hall
2. P.G. Men's Hostel
3. Jubilee Hall
4. International Students House
5. Mansarovar Hostel
6. D. S. Kothari Hostel
7. V.K.R.V. Rao Hostel

For women:

1. University Hostel for women
2. Meghdoot Hostel
3. International Students House for Women
4. North East Students House
5. DSE & SC/ST Students House for Women's

15. Library

The department has a rich and up-to-date collection of about 5000 books for use by the students and the faculty members. The students can also avail the facilities of the Central Science Library of the University.

16. Computing Facilities

Students and faculty members make active use of the computer systems at Department of Computer Science and Delhi University Computer Centre. The department also has up-to-date digital and microprocessor labs.

17. Delhi University Computer Science Society

The students in the Department take part in the activities of Computer Science society. The Society organizes seminars, film shows and invites eminent persons to provide its members with an opportunity of interacting with professionals. The

Society also organizes Inter University Computer festivals which provide an opportunity for conducting programming contests, quizzes, etc. It also undertakes educational tours to various organizations and organizes cultural programmes.

18. Placement Cell

The department has a Placement Cell which invites leading companies from the IT industry for the campus recruitment. The department has had a track record of 100 % placement for several years.

19. Important Points

(i)   Rounding off fractions of a mark is not permissible for determining the eligibility requirement of a candidate.

(ii)   All admissions made to the MCA / M.Sc. (Computer Science) course will be provisional subject to verification of their eligibility by the Mathematical Sciences Course Admission Committee and confirmation by the University.

(iii)   Disputes, if any, arising out of or relating to any matter whatsoever, concerning the process of admission shall be subject to the exclusive jurisdiction of the competent court only in Delhi.

(iv)   There is no direct admission to the second or third year of the MCA /Second Year of M.Sc. (Computer Science) course.

20. Instructions for Entrance Examination for MCA/M.Sc. (Computer Science)

(i)   All candidates will take their seats as per time given in the schedule.

(ii)   Candidates will write particulars on the cover page of the booklet using ball pen, without breaking the seal of the booklet.

(iii)   Breaking open the seal of the booklet: On instruction from the invigilator, the candidates will break open the seal of the booklet and take out the answer-sheet. They will write their particulars and put their signatures using ball point/ fountain pen. They will also encode roll number, category (e.g. GEN/SC/ST/CW/PH/ OBC) paper series and serial number of the test booklet, in HB Pencil only. Specimen is given ahead. Candidates are advised to be careful in filling up these particulars since any wrong entry is likely to render the answer sheet rejected by the computer.

(iv)   Late Entry: The entry in the Examination Hall will not be allowed after the start of the test. Thereafter all doors will be closed and no candidate will be permitted entry in the Examination Hall. Candidates are advised to reach the Centre by the reporting time.

(v)   Pens/Ball Pens/Pencil Erasers: The candidates are required to bring their own ink / ball point pens, HB pencils (any other pencil HH, HHH, etc., should not be used). In case any pencil other than HB pencil is used, the answer sheet may be rejected by the Optical Mark Scanner.

(vi)   Answer Sheet and Checking of Serial Number : The answer sheet is placed inside the booklet. It carries a serial number which should tally with the serial number on the Test Booklet. The candidate should immediately bring to the notice of the invigilator any discrepancy in the serial number on the test booklet and the serial number on the answer sheet placed inside it. In such an event, the candidate will be given a new booklet and answer sheet. In any case, the candidate must not use an answer sheet which has a serial number different from the one given on the test booklet.

(vii)   Rough Work : All rough work is to be done in the space provided in test booklet only. Rough work MUST NOT be done in the answer sheet. The candidate will not bring any sheet for rough work.

(viii)   Test booklet should be unsealed by the Candidate only after the announcement by the Invigilator.

(ix)   The Answer Sheet and the Test Booklet will be collected from the candidate after the Test is over.

(x)   The answers are to be given in the appropriate answer-sheet only and NOT in the Test Booklet.

(xi)   Do not start writing answers until you are asked to do so.

(xii)   Each multiple choice question carries 4 marks. For each correct response the candidate will get 4 marks. For each incorrect response shown in the answer-sheet, one marks will be deducted. No mark will, however, be deducted for not attempting a question. More than one response indicated against a question in the answer sheet will be considered as incorrect response and will be negatively marked.

(xiii)   If you do not understand a particular question go to the next question. If you have time you may come back to it later. You should not ask anything about a question to the Invigilator.

(xiv)   Use of any calculating device like calculator or mathematical tables is not allowed.

(xv)   No candidate will be allowed to leave the Examination Hall until he/she finishes the examination and hands over the answer sheet and test booklet to the invigilator.

(xvi)   Eatables are not allowed in the Examination Hall/Room.

(xvii)   Sample Questions supplied to candidates only indicate the type of questions that may be asked and do not cover the entire syllabus. The degree of difficulty of questions in the Entrance Examination may also vary.

(xviii) Mobile Phones are not allowed in the Examination Hall.

SPECIMEN

ANSWERSHEET

Side-1

Serial No.

40784

Full Name in Capitals

Roll No.: 02743

Centre of exam   Series

Date of Exam

Booklet No.

CANDIDATE'S SIGNATURE (in ball-point pen)

INVIGILATOR'S SIGNATURE (in ball-point pen)

ROLL NO.
| 0 | 2 | 7 | 4 | 3 |

CATEGORY

SC

ST

GEN

CW

PHC

PAPER SERIES
| 1 | 4 |

TEST BOOKLET SERIAL NO.
| 4 | 0 | 7 | 8 | 4 |

Side-2

22. Instructions for Marking Answers in the Answer Sheet

   (a)   Use HB Pencil only.

   (b)   Make Marks DARK and completely fill the oval so that the number inside the oval is not visible.

   (c)   Darken only ONE oval for each question as shown in the example below. If you darken more than one oval, Your answer will be treated as wrong.

Wrong Method	Wrong Method	Wrong Method	Wrong Method	Right Method
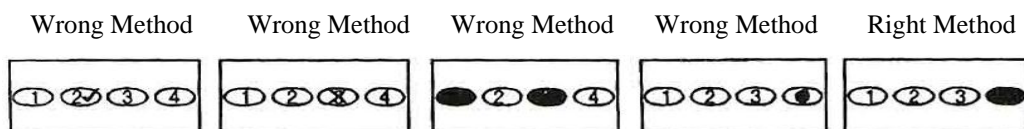
(d) If you wish to change an answer, first ERASE completely the already darkened oval, and then make a fresh mark.

(e) Make marks only in the space provided. Please do not make any stray mark on the answer sheet.

(f) Mark your answer only in the appropriate space against the serial number corresponding to the question you are answering.

23. Conduct Rules (MCA & M.Sc.)

(a) During the examination time, the invigilator will check admission tickets of the candidates to satisfy himself/herself about the identity of each candidate. The Invigilator will also check that the candidates have filled in the particulars correctly. The invigilator will also put his/her signature in the Box provided in the answer sheet. Each candidate must show on demand his/her Admission Ticket bearing his/her Roll Number for admission to the Examination Hall.

(b) A seat with a number will be allotted to each candidate. Candidates must occupy their allotted seats.

(c) No candidate, without the special permission of the Superintendent or the Invigilator concerned, is allowed to leave his/her seat or the Examination Hall until he/she finishes his/her examination. The candidates should not leave the Examination Hall without handing over their Test Booklets and the Answer Sheets to the Invigilator bon duty. No candidate will be allowed to leave for any reason during the first thirty minutes or last fifteen minutes of the duration of the test.

(d) The candidates should not take any article in the Examination Hall except admission ticket, pens, pencils, and erasers for use during the examination. All books and notes etc., should be kept outside the Examination Hall.

(e) The candidates are also advised to bring with them a card board or a clip board on which nothing should be written so that they have no difficulty in marking responses in the Answer Sheet.

(f) Tea, Coffee, Cold Drink, Snacks are not allowed to be taken inside the Examination Hall during examination hours.

(g) The candidates must keep perfect silence during the examination and must not indulge in any conversation or gesticulation.

(h) Use of any calculating device like, log tables, calculator is not allowed.

(i) The candidates must not bring mobile phones, pagers or any other electronic device to the Examination Hall.

(j) The candidates must submit the test booklet and answer sheet to the invigilator. The defaulter will be handed over to the police and the result of such candidates will be withheld.

(k) No clarification regarding any discrepancy in the question paper will be entertained while the examination is in progress. However, a representation either to the Superintendent of the Centre/ Controller of Examinations can be made by the candidate immediately after the examination.

24. Syllabus for the Entrance Examination

MCA

Entrance Exam shall have the following components: Mathematical Ability, Computer Science, Logical Reasoning, and English Comprehension

Syllabus for entrance exam is given below:

Mathematics: Mathematics at the level of B. Sc. program of the University of Delhi.

Computer Science: Introduction to Computer organization including data representation, Boolean circuits and their simplification, basics of combinational circuits; C - programming: Data types including user defined data types, constants and variables, operators and expressions, control structures, modularity: use of functions, scope, arrays.

Logical ability & English Comprehension: Problem-solving using basic concepts of arithmetic, algebra, geometry and data analysis. Correct usage of English Language and Reading comprehension.

M.Sc. (Computer Science)

The syllabus for the M.Sc. (Computer Science) Entrance Examination would be as follows:

Computer Science

Discrete Structures: Sets, functions, relations, counting; generating functions, recurrence relations and their solutions; algorithmic complexity, growth of functions and asymptotic notations.

Programming, Data Structures and Algorithms: Data types, control structures, functions/modules, object-oriented programming concepts: sub-typing, inheritance, classes and subclasses, etc. Basic data structures like stacks, linked list, queues, trees, binary search tree, AVL and B+ trees; sorting, searching, order statistics, graph algorithms, greedy algorithms and dynamic programming

Computer System Architecture: Boolean algebra and computer arithmetic, flip-flops, design of combinational and sequential circuits, instruction formats, addressing modes, interfacing peripheral devices, types of memory and their organization, interrupts and exceptions.

Operating Systems: Basic functionalities, multiprogramming, multiprocessing, multithreading, timesharing, real-time operating system; processor management, process synchronization, memory management, device management, file management, security and protection; case study: Linux.

Software Engineering: Software process models, requirement analysis, software specification, software testing, software project management techniques, quality assurance.

DBMS and File Structures: File organization techniques, database approach, data models, DBMS architecture; data independence, E-R model, relational data models, SQL, normalization and functional dependencies.

Computer Networks: ISO-OSI and TCP/IP models, basic concepts like transmission media, signal encoding, modulation techniques, multiplexing, error detection and correction; overview of LAN/MAN/ WAN; data link, MAC, network, transport and application layer protocol features; network security.

Mathematics

Algebra: Groups, subgroups, normal subgroups, cosets, Lagrange's theorem, rings and their properties, commutative rings, integral domains and fields, sub rings, ideals and their elementary properties. Vector space, subspace and its properties, linear independence and dependence of vectors, matrices, rank of a matrix, reduction to normal forms, linear homogeneous and non-homogenous equations, Cayley-Hamilton theorem, characteristic roots and vectors. De Moivre's theorem, relation between roots and coefficient of nth degree equation, solution to cubic and biquadratic equation, transformation of equations.

Calculus: Limit and continuity, differentiability of functions, successive differentiation, Leibnitz's theorem, partial differentiation, Eider's theorem on homogenous functions, tangents and normals, asymptotes, singular points, curve tracing, reduction formulae, integration and properties of definite integrals, quadrature, rectification of curves, volumes and surfaces of solids of revolution.

Geometry: System of circles, parabola, ellipse and hyperbola, classification and tracing of curves of second degree, sphere, cones, cylinders and their properties.

Vector Calculus: Differentiation and partial differentiation of a vector function, derivative of sum, dot product and cross product, gradient, divergence and curl.

Differential Equations: Linear, homogenous and bi-homogenous equations, separable equations, first order higher degree equations, algebraic properties of solutions, Wronskian-its properties and applications, linear homogenous equations with constant coefficients, solution of second order differential equations. Linear

non-homogenous differential equations, the method of undetermined coefficients, Euler's equations, simultaneous differential equations and total differential equations.

Real Analysis: Neighborhoods, open and closed sets, limit points and Bolzano Weiestrass theorem, continuous functions, sequences and their; properties, limit superior and limit inferior of a sequence, infinite series and their convergence. Rolle's theorem, mean value theorem, Taylor's theorem, Taylor's series, Maclaurin's series, maxima and minima, indeterminate forms.

Probability and Statistics: Measures of dispersion and their properties, skewness and kurtosis, introduction to probability, theorems of total and compound probability, Bayes theorem random variables, and probability distributions and density functions, mathematical expectation, moment generating functions, cumulants and their relation with moments, binomial Poisson and normal distributions and their properties, correlation and regression, method of least squares, introduction to sampling and sampling distributions like Chi-square,t and Fdistributions, test of significance based on t, Chi-square and Fdistributions.

Selected References:

G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley.

C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill.

M. Mano, Computer System Architecture, Prentice-Hall of India,

G. Nutt, Operating Systems: A Modern Perspective, Pearson Education.

R. Elmasri, S. B. Navathe, Fundamentals of Database Systems, Addison, Wesley.

Jan. F. Blake, An Introduction to Applied Probability, John Wiley.

R. S. Pressman, Software Engineering: A Practitionr's Approach McGraw Hill.

A. Silberschatz, P.B. and Greg Gargne, Galvin. Operating System Concepts, John Wiley.

A. S. Tanenbaun, Computer Networks, Pearson Education/Prentice Hill of India.

J. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, Prentice Hall of India.

M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C++, John Wiley & Sons.

25. Sample Questions   MCA   PART – I

1.   The points $1 + i$, $1-i$, -1, $-i$ are

    (1)   Collinear.

    (2)   Within a circle of radius 1.

    (3)   Vertices of an equilateral triangle.

    (4)   none of the above.

2.   The asymptotes of the curve –

    $(y - x)(y - 2x)^2 + (y + 3x)(y - 2x) + 2x + 2y - 1 = 0$ are

    (1) $y = x + 4$, $y = 2x - 2$, $y = 2x - 3$

    (2) $y = x$, $y = x + 1$, $y = x/2$

    (3) $y = -3x$, $y = x$, $y = x/2$

    (4) $y = x - 4$, $y = 2x + 2$, $y = 2x + 3$

3.   If Q denotes the field of rational numbers and C denotes the field of complex numbers then C as a vector space over Q has dimension

    (1)   2

    (2)   even

    (3)   odd

    (4)   infinity

4.   If every cross-section of a bounded surface in three dimensions is a circle then surface

    (1)   must be a sphere

    (2)   must be a cylinder

    (3)   must be a cone

    (4)   must be a third-degree surface

5.   Trace of a square matrix is the sum of its diagonal elements. Suppose A is a matrix with complex entries. Let A' represent the transpose of A. Then

    (1) $A = 0$ if trace $(A^T A) = 0$

    (2) $A = 0$ if A has real entries and trace $(AT\ A) = 0$

    (3) $A = 0$ if trace$(A^2) = 0$

    (4)   Trace (A^2) has non-negative real part.

6.   If a statistic t has Student's distribution with 1 d.f. then the distribution of t^2 is

    (1) $\beta_2\ (1,1)$

    (2) χ^2 with 1 d.f.

(3)   F with (1,1) d.f

(4)   none of the above

7.   The terms of two divergent series $\Sigma\ a_n$, $\Sigma\ b_n$ decrease to zero. Then the series Σ *min* (a_n, b_n)

(1)   diverges

(2)   may converge

(3)   always oscillates

(4)   none of the above

8.   Two random variables X and Y are such that $Y = X^2$. Then the correlation coefficient between X and Y

(1)   is 1

(2)   is positive

(3)   is zero

(4)   need not exist.

9.   A function $f(x)$ defined in an interval [a, b] attains a maximum value at $x = b$. Then

(1) $f(b) = 0$

(2) $f(b)$ need not exist.

(3) $f(x)$ is monotonically increasing in [a, b].

(4) $f(b) < 0$.

10.   Let $f(x) = |\ x\ |$, $x \in [-1, 1]$. Consider the following statements: (*i*) $f(x)$ is continuous everywhere, (*ii*) $f(x)$ is differentiable everywhere. (*iii*) $f(x)$ is not differentiable at $x = 0$. Then

(1)   All the statements are false.

(2)   Only (*iii*) is false.

(3)   Only (*iii*) is true.

(4)   Only (*ii*) is false.

11.   If $\vec{a}$ and $\vec{b}$ are unit vectors such that the length $(\vec{a} + \vec{b})$ is $\sqrt{2}$ then angle between $\vec{a}$ and $\vec{b}$ is

(1)   90°

(2)   60°

(3)   45°

(4)   30°

12.   The order and degree of the differential equation

$[1 - (dy/dx)^2]^{3/2} = \left(\dfrac{d^2 y}{dx^2}\right)^{2/3}$ are respectively

(1) 2 and 4

(2) 2 and 9

(3) 1 and 18

(4) 2 and 18

13. The sequence $< a_n >$ defined by

$a_n = 2 + (-1)^n/n$

(1) is convergent and converges to 2

(2) is not convergent

(3) oscillates between 0 and 2

(4) oscillates infinitely

14. Find the value of K for which the equation, $x^3 + 3x + K = 0$ has two distinct roots in [0, 1].

(1) 0

(2) 1

(3) 1/2

(4) None

15. Consider the following Venn Diagram :
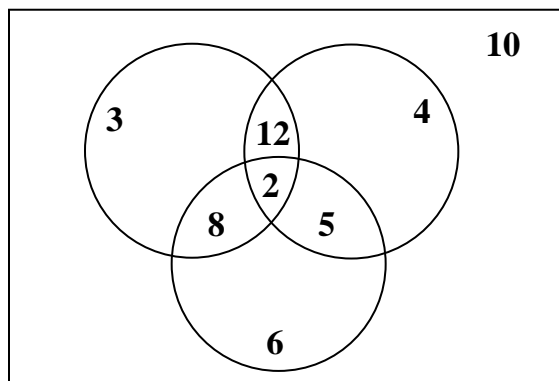
The number in the Venn diagram indicates the number of persons reading the newspapers. The diagram is drawn after surveying 50 persons. In a population of 5000, how many could be expected to read at least two newspapers?

(1) 2500

(2) 2700

(3)   3000

(4)   106

16.   The flowchart shown below describes an algorithm to evaluate the sum of first 100 odd numbers.
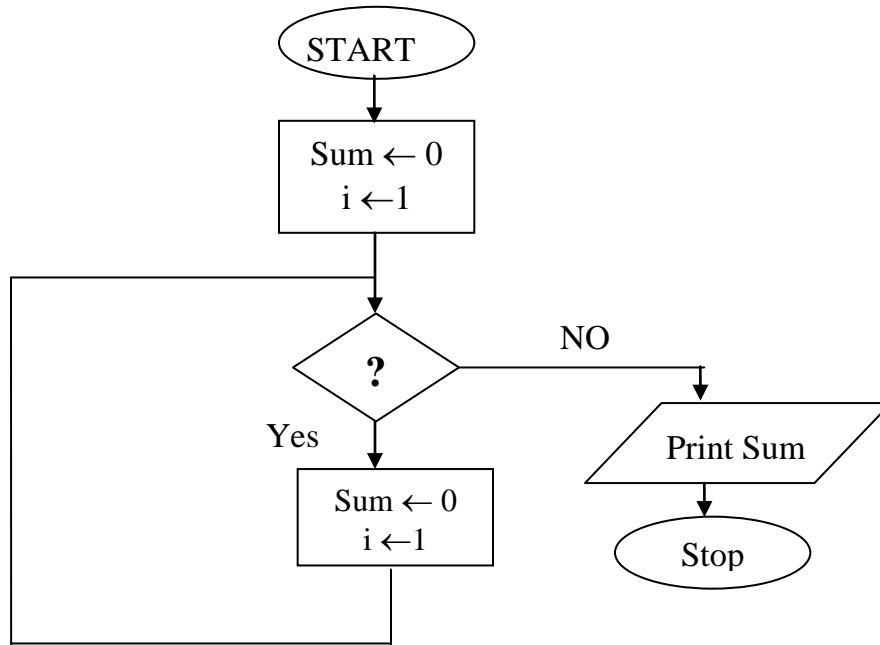
The correct condition in place of? In the diamond box should be

(1)   i < 100

(2)   i < 101

(3)   i < 199

(4)   None of the above

17.   A gambler played the following game with a friend. He bet half the money in his pocket on the toss of a coin; he won on heads and lost on tails. The coin was tossed and the money held by the gambler. At the end, the number of times the gambler lost was equal to the number of times he won. Then:

(1)   he gained

(2)   he lost

(3)   he broke even

(4)   all these are possible

18.   The number of zeroes in the binary representation of $8^5+8^3+5*8^2+7*8+7$ is:

(1)   7

(2)   8

(3)   9

(4) none of the above.

19. Consider the following truth table :

p	q	$f(p,q)$
T	T	T
T	F	T
F	T	F
F	F	F

Then $f(p,q)$ can be written as

(1) p and q

(2) p or q

(3) p

(4) q

20. A, B, C, D, are four persons with pairwise distinct wealth such that at least one of {A, B} is richer than at least one of {C, D), at least one of {A,D} is richer than at least one of {B,C}. Then :

(1) A is the richest

(2) B is not the richest

(3) A is not the poorest

(4) none of the above.

21. Consider the following five statements of which exactly one is false :

(1) A is taller than B.

(2) B is taller than D.

(3) C is taller than D.

(4) B is taller than C.

(5) A is taller than C.

Then

(1) the false statement is (4)

(2) the false statement is (1)

(3) the false statement is (5)

(4) the false statement is (2)

For questions 22 and 23

Given below are the data of the examination result:

Total appeared	6300
Passed	1430
Passed in History	3630
Passed in Geography	3660
Passed in Civics	3510
Passed in Economics	3570
Passed in at least three subjects	2630

22. How many candidates passed in Geography, but failed in one or more subjects?

    (1)   1200

    (2)   1820

    (3)   2230

    (4)   3670.

23. How many candidates failed because of having failed in two or more subjects?

    (1)   790

    (2)   1820

    (3)   2230

    (4)   3670

Read the following paragraph and answer the question that follow:

The Asian Rhino is facing extinction as the rampant hunting down of the animal for its hide, purportedly having medicinal properties, is on the rise. Recent news from the two strongholds of the Asian Rhino, the Kaziranga National Park in Assam and the Chitwan National Park in Nepal presents an intriguing scenario. For Kaziranga, the year 2007 was one of the worst in a decade as far as rhino poaching was concerned. At least twenty of these animals were poached, mainly shot, in and around these extensive grasslands on the banks of the mighty Brahmaputra. In Nepal, in comparison, 2007 turned up looking distinctly good for the rhino; only two animals, one each in Chitwan and Bardia National Parks, were poached in the entire calendar year. Compare this with the preceding twelve months and the contrast is conspicuous. 2006 was the complete opposite of 2007 and drastically so. Kaziranga lost only six rhinos in 2006 to poachers, while the number for Nepal was at least twenty with fourteen being in and around Chitwan alone. The

turnaround in Nepal is remarkable considering the fact that almost thirty rhinos on an average had been poached here annually in the last few years. Most observers point to the political resolution that has taken place in the country and the peace that has returned with the establishment of a democratic regime ending years of turmoil and armed resistance during the monarchy.

24. The number of Asian Rhinos is going down because,
(1) They are being killed by amateur hunters
(2) They are not well-protected in sanctuaries
(3) They are being hunted down by poachers
(4) They are becoming extinct because their habitats are shrinking.

25. The National parks mentioned in the passage are
(1) In India
(2) One each in India and Nepal
(3) One in India and two in Nepal
(4) Two in India and one in Nepal

26. The comparison shows that
(1) The situation has improved in Nepal but worsened in India
(2) It has improved in India but worsened in Nepal
(3) It has worsened in both
(4) It has improved in both

27. Mark the statement that is NOT true
(1) The river Brahmaputra flows by Kaziranga
(2) The rhino's hide is believed to have medicinal properties
(3) 'Establishment of democracy' refers to Nepal
(4) More rhinos were killed by poachers in India in 2006 than in 2007

MCA PART – II

1. Find the value of k for which the equation, $x^3 + 3x + k = 0$ has two distinct roots in [0, 1].

2. Find the volume of the solid bounded by the paraboid $x = x^2 + y^2$, cylinder $y = x^2$ and the planes y=1, z=0

3. If the normal at one end of a latus rectum of the hyperbola, $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$

   is parallel to one of its asymptotes; then find its eccentricity.

4.   Simply the following Boolean function using K. maps

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

5.   Arrange the following operations in ascending order of precedence. Indicate associativity (left/right) for each operator +   * / < << = != ?

6.   What will be the output for the following program segment:

```
int sum = 0;
int i,j;
for (i=1; i<5; i++)
   for (j=1; j<10; j++)
      sum = sum+j;
cout<<sum;
```

7.Read the following paragraph and answer the questions that follow:

The Asian Rhino is facing extinction as the rampant hunting down of the animal for its hide, purportedly having medicinal properties, is on the rise. Recent news from the two strongholds of the Asian Rhino, the Kaziranga National Park in Assam and the Chitwan National Park in Nepal presents an intriguing scenario. For Kaziranga, the year 2007 was one of the worst in a decade as far as rhino poaching was concerned. At least twenty of these animals were poached, mainly shot, in and around these extensive grasslands on the banks of the mighty Brahmaputra. In Nepal, in comparison, 2007 turned up looking distinctly good for the rhino; only two animals, one each in Chitwan and Bardia National Parks, were poached in the entire calendar year. Compare this with the preceding twelve months and the contrast is conspicuous. 2006 was the complete opposite of 2007 and drastically so. Kaziranga lost only six rhinos in 2006 to poachers, while the number for Nepal was at least twenty with fourteen being in and around Chitwan alone. The turnaround in Nepal is remarkable considering the fact that almost thirty rhinos on an average had been poached here annually in the last few years. Most observers point to the political resolution that has taken place in the country and the peace that has returned with the establishment of a democratic regime ending years of turmoil and armed resistance during the monarchy.

(i)Why is the number of Asian Rhinos is going down ?
(ii) In what sense does the National Park in Nepal present an intriguing scenario?

M.Sc. (Computer Science)

Part I

1. Which of the following is not a group with respect to the composition 'composite of functions'?

    (1) The set G consisting of four functions f_1, f_2, f_3, f_4, defined by $f_1(x) = x$, $f_2(x) = -x$, $f_3(x) = 1/x$, $f_4(x) = -1/x$ for all $x \in R \sim \{0\}$,

    (2) The set G = {functions $f_c: R \to R$, $f_c(x)$ -x + c, $c \in R$}

    (3) The set G of all functions from a set A consisting of four elements to itself.

    (4) The set G = {functions $f_c : R \to R : f_c(x) = cx, c \in R \sim \{0\}$}

2. Which of the following statements is not true?

    (1) If U is a ring with unity in which each-non-zero element is a unit, then each non-zero element of each quotient ring of R is also a unit,

    (2) If U is right ideal and V is a left ideal of a ring R, then U∩V is either a left or a right or a two sided ideal of a ring R.

    (3) In a ring with unity and without zero divisors, the only idempotents are the unity and the zero.

    (4) Every maximal ideal in a commutative ring with unity is a prime ideal.

3. Let V be the vector space of all 4x4 matrices over R. Then, which of the following fails to be a subspace of V?

    (1) The set of all upper triangular matrices in V.

    (2) The set of all symmetric matrices in V.

    (3) The set of all diagonal matrices in V.

    (4) The set of all singular matrices in V.

4. The six roots of the equation $(2+z)^6 + (2-z)^6 = 0$ are

    (1) $\pm i \tan \pi/6$, $\pm 2i \tan \pi 5 /12$, $\pm i$

   (2) $\pm 2i \tan \pi/12$, $\pm 2i \tan 5 \pi /12$, $\pm 2i$

(3) $\pm i \tan \pi/123 \pm 3i \tan \pi/24, \pm i$

(4) $\pm i \tan /24, \pm 3i \tan \pi/12, \pm 2i$

5.   Which of the following is false?

   (1)   It $(1+\cos x)^{a \sec x} = e^3$
          $x \to \pi/2$

   (2)   It $e^{1/x}/(1+e^{1/x}) = 0$
          $x \to \pi/2$

   (3)   The function $f(x) = (x-1)/(1/e^{1/(x-1)})$ $: x \neq 1$

                              0 $: x \neq 0$

          is continuous at $x = 1$.

   (4)   For two functions f and g, if the product fg is continuous at a point, then f
          and g may or may not be continuous at that point.

6.   For the curve $x^2 y^2 = (a+y)^2 (b^2-y^2)$

   (1) $(0,-a)$ is a node, a cusp or a conjugate point according as $b>a$, $b=a$ or $b<a$
          respectively.

   (2) $(0, -a)$ is a cusp, a node or a conjugate point according as $b>a$, $b=a$ or $b<a$
          respectively.

   (3) $(0, -a)$ is a node, conjugate point or a cusp according as $b>a$, $b=a$ or $b<a$
          respectively.

   (4) $(0, -a)$ is a conjugate point, a cusp, or a node according as $b>a$, $b=a$, or $b<a$.

7. $\int_0^{x/2}$ $(\sin 3\theta \sin 5\theta), / \sin \theta \, d\theta$ is equal to

   (1)   71/105

   (2)   72/105

   (3)   73/105

   (4)   74/105

8.   Find the volume of the solid bounded by the paraboid $x = x^2+y^2$,

      cylinder $y = x^2$ and the planes y=1, z=0

   (1)   85/105

   (2)   86/106

   (3)   87/105

   (4)   88/105

9.   If $|f(x) - f(y)| < (x-y)^2$, for all real numbers x and y and f is differentiable over [a,
      b], then

(1)   f is strictly monotonically increasing function over [a, b]

(2)   f is strictly monotonically decreasing function over [a, b]

(3)   f is a constant function over [a, b]

(4)   Nothing can be concluded about the function f.

10.   If on an average, 1 vessel in every 10 is wrecked, then the probability that out of 5 vessels expected to arrive, at least 4 will arrive safely is

(1)   0.91854

(2)   0.3216

(3)   0.0012

(4)   0.6384

11.   If $F = (y^2 + z^3, 2xy - 5z, 3xz^2 - 5y)$, then a scalar function $\phi(x,y,z)$ such that F=grade. ϕ is given by

(1) $xy + xz^3 - yz + c$

(2) $y + xz^2 + 2xy + c$

(3) $xy2 + xz^3 - 5yz + c$

(4) $xyz + xz^2 + yz + c$

12.   Consider a complete binary tree with root at level 1. The number of nodes at level i is

(1)   2i – 1

(2)   2i

(3)   2i – 1

(4) $2^{i-1} - 1$

13.   Consider the following Binary Search Tree
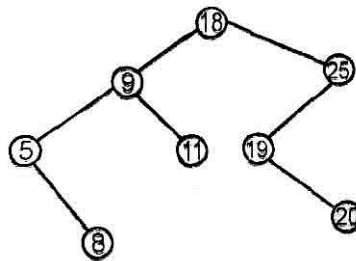
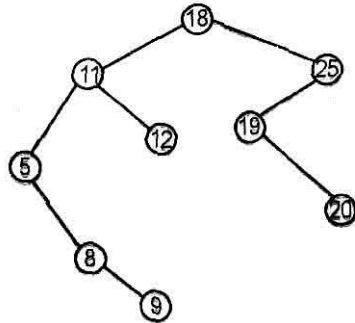The tree that results after inserting 12 is
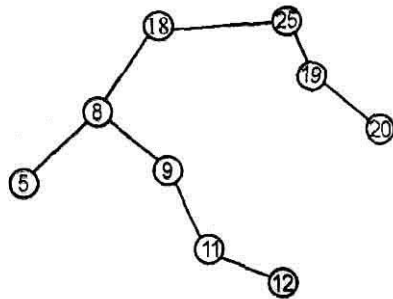
(1)
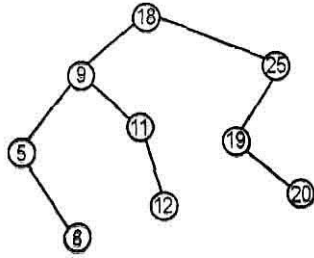
(2)

(3)

    (4)   None of these

14.   Which of the following is true?

    (1) $(n+b)^a = O(n^b)$

    (2) $(n+b)^a = O(n^a)$

    (3) $(n+b)^a = O(a^n)$

    (4) $(n+b)^a = O(b^n)$

15.   A tree $G = (V, E)$ has

    (1) $|V|$ edges

(2) $|V|-1$ edges

(3) $(|V|-1)/2$ edges

(4) None of the above

16. Which algorithm is best suited to sort a list which is almost sorted?

(1) Quick sort

(2) Merge sort

(3) Insertion sort

(4) Heap sort

17. Consider the following algorithm

for i ← 1 to n–1

    for j ← i + 1 to n

        print(i, j)

The number of times print statement is executed in the above algorithm is

(1) 2n

(2) $\dfrac{n(n-1)}{2}$

(3) $\dfrac{n(n+1)}{2}$

(4) $n \log_2 n$

18. Which of the following is true?

(1) $n^k = 0(n^{k+1})$

(2) $n^k = \theta\,(n^{k+1})$

(3) $n^{k+1} = O\,(n^k)$

(4) None of these

19. For any given graph G, the worst case complexity of DFS is

(1) more than that of BFS

(2) same as that of BFS

(3) less than that of BFS

(4) $O\,(|E|)$ where $|E|$ is the number of edges in G.

20. The process to process delivery of the entire message is the responsibility of the

(1) network layer

(2) transport layer

(3)   physical layer

(4)   application layer

21.   Which logic does the following table represent

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

(1)   AND

(2)   OR

(3)   XOR

(4)   None of the above

22.   Which of the following application would fall in the category of real-time applications?

(1)   pay-roll application

(2)   airline- reservation application

(3)   video-conferencing application

(4)   process-control applications of chemical plant

23.   Let R (A3) be a relational scheme, then R is necessarily in

(1)   first normal form only

(2)   first, and second normal forms only

(3)   first, second and third normal forms only

(4)   first, second, third normal forms as well as BCNF

24.   Key process areas of CMM level 4 are also satisfied by a process which is

(1)   CMM level 2

(2)   CMM level 3

(3)   CMM level 5

(4)   All of the above.

15.   CPU gets the address of the next instruction to be processed from

(1)   Instruction register

(2)   Memory address register

(3)   Index register

(4)   Program counter.

Part II

1.   Show first three iterations of the insertion sort algorithm for arranging the data in ascending order:

16, 7, 5, 4, 20, 36.

2.   Give a recursive algorithm to compute the height of a binary tree.

3.   Differentiate between method overloading & method overriding.

4.   Prove that the sum of the series $\cos \theta \sin \theta + \cos^2\theta \sin^2\theta + \cos^3\theta$

$\sin^3\theta + ...$ to n terms, $(q \neq k\, TT)$ is $\cot \theta (1 - \cos^n \theta \cos n\, \theta)$.

5.   If the normal at one end of a latus rectum of the hyperbola, $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$

is parallel to one of its asymtotes; then find its eccentricity.