DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF DELHI
DELHI - 110007

INFORMATION BULLETIN 2009-2010

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 650 alumni at important positions in information technology industry in India and abroad.

M.Sc. Computer Science

The M.Sc. Computer Science Course introduced in the year 2004 in the Department aims to develop core competence in Computer Science and prepares 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 Postgraduate 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 (Ph.D.) programme aimed at producing quality researchers.

Undergraduate Programmes

The University offers a three-year B. Sc. (Honours) Computer Science programme through its constituent Colleges. The B. Sc. (Honours) programme primarily intends to serve as input for higher degrees academic programmes in Computer Science. The programme lays emphasis on building a strong mathematical foundation and includes modules on electronics and humanities as well. The courses at B. Sc. (Applied 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 ADMISSION
M.Sc. Computer Science

1.	(a) Starting date for obtaining Application Forms	Wednesday, 13th May, 2009
	(b) Last date for receipt of completed Application Forms	Monday, 8th June, 2009
	Timings	9.30 a.m. to 12.30 p.m.
2.	Date of Admission Test	Saturday, 20th June, 2009
	Timings	
	Test I	9.30 a.m. to 12.30 p.m.
	Test II	1.30 p.m. to 4.30 p.m.
	Reporting Time	
	Test I	9.00 a.m.
	Test II	1.00 p.m.
3.	Declaration of result	Tuesday, 30th June, 2009 at 5.00 p.m. (Tentative)

MCA

Admission to the MCA programme is based on the performance of the candidates in the JAM (Joint Admission Test for M.Sc.) conducted by IIT system as per datails available at http://jam.iitkgp.ac.in.

Last date of applying for the year 2009-2010 is over.

Candidates qualifying JAM are required to apply on the prescribed admission form which will be available from the Department at the time of counseling. The form will also be available at the Department website **http://cs.du.ac.in**

Date of Counseling — Monday 13th July 2009

PGDCA

To be announced later through advertisment in newspapers.

3. Eligibility Conditions for M.Sc. Computer Science

- 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. Minimum Percentage Required: 60% marks in aggregate.
- 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 with 60% marks in Computer Science and Mathematics separately.
- Any Bachelor's Degree of University of Delhi with at least eight papers in Computer Science and two papers in Mathematics under Semester system/ at least six papers in Computer Science and two papers in Mathematics under Annual Examination System, or any other University whose examination is recognized as equivalent to University of Delhi. Minimum Percentage Required: 60% marks in aggregate, and 60% marks in Computer Science and Mathematics separately.

Notes:

(i) The candidates who are appearing in the final year examination on the basis of which admission is sought are also eligible to apply.

(ii) Relaxation of 5% marks will be allowed for the SC/ST category candidates.

4. Age Requirement

(i) No person shall be eligible for admission to first year of the 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) 15% and 7½ % of total number of seats will be reserved for Scheduled Caste and Scheduled Tribe candidates respectively, subject to production of certificate as mentioned in 6 (a).

(b) (i) 5% of the total number of seats will be reserved for the Children or

Widows/Wives of Officers and Men of the Armed Forces including Para Military Personal killed or disabled in action. (ii) The cases of the Wives/Widows/ Children of Officers and Men of the armed forces including Para-Military Personnel who died/were disabled while on duty will be considered for admission if any seat remains vacant after admission of persons mentioned above in category (i). Above reservation is subject to production of certificate as mentioned in 6 (b).

Note: In case sufficient number of eligible candidates mentioned in (a) and (b) above are not available, the vacancies in the respective categories will be treated as unreserved.

(c) 3% of seats will be 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 (FSR) 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 admission test 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 admission test, the admission of the foreign students 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.

(e) Seats are reserved for Other Backward Classes (OBC) candidates as per university rules. Reservation is subject to production of certificate as mentioned in 6 (a).

6. Certificate Required for Reserved Categories

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

(a) SC/ST/OBC Certificate : For admission to a seat reserved for Scheduled

Castes / Scheduled Tribes / Other Backward Classes, attested copy of certificate from an approved district authority stating the Scheduled Caste/Tribe /OBC to which the candidate belongs should be submitted. 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 Children of Widows/ Wives of Officers and Men of the Armed Forces including Para Military Personnel Killed or Disabled in action, Wives/Widows/ Children of officers and Men of the Armed Forces including Para Military Personnel who died/were disabled while on duty 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 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.

However, 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 for M.Sc. Computer Science

(a) 50% of the seats shall be filled on the basis of merit in the B.Sc. (Honours) Computer Science examination 2009 of the University of Delhi. Only those students who have filled the Application form and secured at least 60% marks in the B.Sc. (Honours) Computer Science examination 2009 of the University of Delhi shall be eligible for consideration under this category.

(b) The admission for the remaining 50% seats in the M.Sc. Computer Science course shall be based on Admission Test which will consist of two parts:

Test I : It shall be objective type.

Test II : It shall consist of comprehensive questions.

Notes:(i) In the event of any short fall of admissions under direct quota reserved for B.Sc. (Honours) Computer Science Students of the University of Delhi, the remaining seats will be added to the quota for the candidates seeking admission through Admission Test or Vice-versa.

(ii) The candidates who have passed their B.Sc. (Honours) Computer Science examination from University of Delhi and are interested to take admission to M.Sc. Computer Science programme under category 7(a) are required to fill the application form and are advised to seek admission through Admission Test as well.

(iii) In the event of selection both under category (a) and (b), the candidate will not be considered for admission under category (b) i.e. based on Admission Test.

8. Course Structure of the M.Sc. Computer Science Programme**

(a) The students would be required to register for the courses in the first year as follows :

Semester I

Paper No.	Title	L-T-P*	Credits	Total Marks
MCS-101	Algorithms	3-1-0	4	100
MCS-102	Artificial Intelligence	3-0-2	4	100
MCS-103	Computer Security	3-0-2	4	100

****under revision**

MCS-104	Data Mining	3-0-2	4	100
MCS-105	Computational Intelligence	3-0-2	4	100

Semester II

Paper No.	**Title**	**L-T-P***	**Credits**	**Total Marks**
MCS-201	Compiler Design	3-0-2	4	100
MCS-202	Operating System Design & Practice	3-0-2	4	100
MCS-203	Database System & Implementation	3-0-2	4	100
MCS-204	Advanced Computer Networks	3-0-2	4	100
MCS-205	Modeling & Simulation	3-0-2	4	100

(b) The students would be required to register for the courses in the second year as follows :

Semester III

(i) MCS-301 Minor Project : 8 credits

(ii) At least three electives out of those offered by the Department as mentioned in 8(c), or those offered by other Departments as approved by the Department. For a course offered by another Department, suitable number of credits would be allocated, as may be decided by the Department. For each of the courses MCS 313-MCS 320, the choice of topics shall be determined by the Department at the beginning of every semester.

Semester IV

MSC-401 Major Project: 20 credits

(c) Elective Courses

Paper No.	Title	L-T-P*	Credits	Total Marks
MCS-302	Electronic Commerce	3-0-2	4	100
MCS-303	Digital Image Processing & Multimedia	3-0-2	4	100
MCS-304	Neural Networks	3-0-2	4	100
MCS-305	Numerical Computing	3-0-2	4	100
MCS-306	Combinatorial Optimization	3-0-2	4	100
MCS-307	Computational Linguistics	3-1-0	4	100
MCS-308	Software Quality Assurance & Testing	3-0-2	4	100
MCS-309	Machine Learning	3-0-2	4	100
MCS-310	Real-Time Systems	3-0-2	4	100
MCS-311	Cryptography	3-0-2	4	100
MCS-312	Distributed Computing	3-0-2	4	100
MCS-313	Special Topics in Computer Networks	3-0-2	4	100
MCS-314	Special Topics in Data Mining	3-0-2	4	100
MCS-315	Special Topics in Software Engineering	3-0-2	4	100
MCS-316	Special Topics in Theoretical Computer Science	3-1-0	4	100
MCS-317	Special Topics in Information Security	3-0-2	4	100
MCS-318	Special Topics in Soft Computing	3-0-2	4	100
MCS-319	Special Topics in Software System	3-0-2	4	100
MCS-320	Special Topics in Artificial Intelligence	3-0-2	4	100

***L-T-P : Lectures - Tutorials - Practicals**

9. Application Fee for M.Sc. Computer Science

Rs. 250 for SC/ST Category	Rs. 500 for Others
Mode of Payment	Payment should be made by crossed Bank Draft only, in favour of **"Registrar, University of Delhi"** payable at New Delhi.

Note: In case of a request for application form by post a candidate is required to send the Bank Draft together with a self-addressed stamped (worth Rs.30/-) envelope of size 10``x 7`` to Office-in-charge, Room No. 113, Dept. of Computer Science, New Academic Block, University of Delhi, Delhi- 110007.

Candidate should also mention the Course for which he/she applies, Name, Contact No and Address on the backside of Bank Draft.

The Department will not be responsible for nondelivery or delayed delivery of the form sent by mail.

10. Course fee for 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

The number of sanctioned seats in M.Sc. Computer Science programme is 23(G) + 6(SC) + 3(ST) + 9(OBC) .

12. Admission Ticket

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 and Serial Number of Application Form, not earlier than three days before the date of the AdmissionTest, 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. Course Fee Concession

Upto 10% of the candidates may be exempt from payment of course fee as per University rules for M.Sc. Computer Science programme.

14. Hostel Accommodation

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

Formen:

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

ForWomen:

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

15. Library

The Department has a rich and up-to-date collection of more than 4000 books for use by the students and the faculty members. Students 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 the 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 and film shows, and invites eminent professionals to provide its members with an opportunity to interact with them. The Society also organizes interuniversity computer festivals that include 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 fraction of a mark is not permissible for determining the eligibility requirement of a candidate.

(ii) All admissions made to the M.Sc. Computer Science programme will be provisional subject to verification of their eligibility by the Mathematical Sciences Courses' 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 courts in Delhi only.

(iv) There is no direct admission to the Second Year of M.Sc. Computer Science programme.

20. Instructions for Admission Test

(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/Pencils/Erasers:* The candidates are required to bring their own 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 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 on 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 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 answer 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 mark 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/Room until he/she finishes the examination and hands over the question paper and the answer sheet to the invigilator.

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

(xvii) Sample Questions supplied to candidates may not reflect the difficulty level of the actual Examination paper.

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

21. SPECIMEN

Serial No. 40784

ANSWER SHEET (ORS)

Side-1

	1. (FULL NAME IN CAPITALS)

2. ROLL NO.	3. CENTRE OF EXAM	4. CATEGORY	5. SERIES

6. TEST BOOKLET SERIAL NO.	7. DATE OF EXAM.

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Side-2

8. CANDIDATE'S SIGNATURE (in bal-point pen)

9. INVIGILATOR'S SIGNATURE (in bal-point pen)

10. ROLL NO.

0	2	7	4	3

11. CATEGORY

SC ○
ST ○
OBC ○
GEN ○
CW ○
PH ●

12. SERIES

14

13. TEST BOOKLET SERIAL NO.

4	8	7	8	4

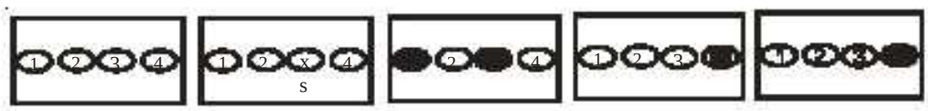
22. Instructions for Marking Answers in the Answer Sheet

(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, 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

(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. The 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 Booklet and the Answer sheets to the invigilator on 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 and 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 and 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/ Dean, Examinations can be made by the candidate immediately after the examination.

24. Syllabus for the Admission Test (M.Sc. Computer Science)

The syllabus for the entrance test 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 & 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 trees, AVL and B+ trees; sorting and 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 functionality, multiprogramming, multiprocessing, multithreading, timesharing, real-time operating systems: 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 coefficients of n_{th} degree equation, solution to cubic and biquadratic equations, transformation of equations.

Calculus: Limit and differentiability of functions, successive differentiation, Leibnitz's theorem, partial differentiation, Euler'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, spheres, 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 kutrosis, 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 F-distributions, test of significance based on t, Chi-square and F-distributions.

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.

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

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

A. Silberschatz, P.B. Galvin, G. Gagne. Operating System Concepts, Sixth edition, John Wiley.

A. S. Tanenbaum, Computer Networks, Pearson Education/Prentice Hall of India

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

25. Sample Questions (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 $G = \{\text{functions } f_c : R \to R, f_c(x) = x + c, c \in R\}$

(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 R : $f_c(x) = cx$, c $\square$**P** ~ {0}}

2. Which of the following statements is not true?

(1) If R is a ring with unity in which each nonzero element is a unit, then each nonzero element of each quotient ring of R is also a unit.

(2) If U is a right ideal and V is a left ideal of 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) ± i tan □/6, ±2 i tanπ5/12, ± i
(2) ± 2i tan □/12, ±2 i tan 5π/12, ± 2i
(3) ± i tan □/12, ±3i tan □/24, ± i
(4) ± i tan □/24, ± 3i tan □/12, ±2i

5. Which of the following is false?

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

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

(3) The function $f(x) = \begin{cases} (x-1) / (1+e^{1/(x-1)}) & : x \neq 1 \\ 0 & : x = 1 \end{cases}$

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

   (1) 71/105
   (2) 72/105
   (3) 73/105
   (4) 74/105

8. 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 is
   (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.

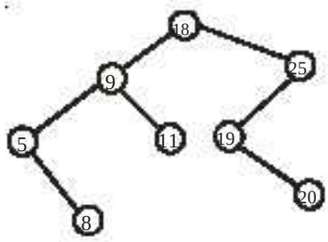
10. If on an average, 1vessel in every 10 is wrecked, then the probability that out of 5 vessels expected to arrive, at least 4 will arrive safely is
   (1) 0.91854
   (2) 0.3216
   (3) 0.0012
   (4) 0.6384

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

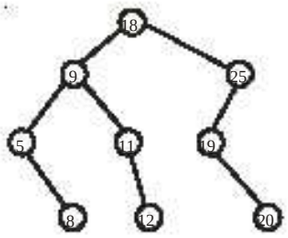
(2) $y + xz_2 + 2xy + c$
(3) $xy_{2+} xz_3 - 5yz + c$
(4) $xyz + xz_2 + yz + c$

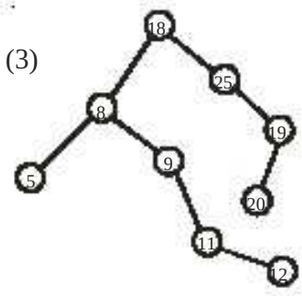
12. Consider a complete binary tree with root at level 1. The number of nodes at level i is:
(1) $2i - 1$
(2) 2_i
(3) $2i + 1$
(4) $2_{i-1} - 1$

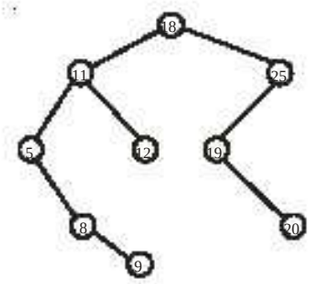
13. Consider the following Binary Search Tree



The tree after inserting 12 would be

(1)


(3)


(2)


(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) $\frac{n(n-1)}{2}$
(3) $\frac{n(n+1)}{2}$
(4) $n \log_2 n$

18. Which of the following is true?
(1) $n_k = O(n_{k+1})$
(2) $n_k = \backslash(\nu_{k+1})$
(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 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 applications would fall in the category of real-time applications?

(1) payroll application.
(2) airline-reservation application.
(3) video-conferencing application.
(4) process-control applications of chemical plant.

23. Let R (A,B) 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.

25. 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 and method overriding.

4. Prove that the sum of the series Cos ⌊ Sin ⌊ + Cos_2⌊ Sin_2⌊ + Cos_3⌊ Sin_3⌊ +...to n terms, (q $\bar{k}$ □) is Cot ⌊ (1-cos_n⌊ Cos nθ).

5. If the normal at one end of a latus rectum of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is parallel to one of its asymptotes, then find its eccentricity.