UNIVERSITY OF DELHI

DEPARTMENT OF COMPUTER SCIENCE
ADMISSION BROCHURE

(2016-2017)

MASTER OF COMPUTER APPLICATIONS

&

M.Sc. COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF DELHI

DR. SUNIL KUMAR MUTTOO
HEAD OF THE DEPARTMENT

Faculty Members

1.	**DR. SUNIL KUMAR MUTTOO**	HOD, Associate Professor
2.	**PROF. VASUDA BHATNAGAR**	Professor
3.	**MR. PRADYOT KANTI HAZRA**	Associate Professor
4.	**DR. NAVEEN KUMAR**	Associate Professor
5.	**DR. PUNAM BEDI**	Associate Professor
6.	**DR. NEELIMA GUPTA**	Associate Professor
7.	**SIX ADHOC FACULTY MEMBERS**	Assistant Professors

Administrative Staff

1.	**MR. CHANDARPAL**	Office In-charge, Senior Assistant
2.	**MR. RAJBIR GIRI**	Office Attendant
3.	**MR. KANHIYA LAL**	JACT- On Contractual Basis
4.	**MRS. HIMANI SAINI**	JACT- On Contractual Basis
5.	**MR. BALKISHAN**	Office Attendant- On Contractual Basis

Technical Staff

1.	**MRS. DEVKI RAWAT**	Laboratory In-charge, Technical Assistant
2.	**MR. ANAND SINGH**	Laboratory Attendant
3.	**MR. BANSRAJ RAM**	Laboratory Attendant
4.	**MR. NIKHIL**	Sr. Technical Assistant-On Contractual Basis
5.	**MR. NISHANT BANIWAL**	Laboratory Attendant-On Contractual Basis

Office Contact Details:

DEPARTMENT OF COMPUTER SCIENCE
Faculty of Mathematical Sciences,
Opposite Daulat Ram College,
Room No. 113, First Floor,
North Campus, University of Delhi, Delhi-110007.
Ph. No.: 011-27667059, 27667591
Fax No.: 011-27662553
Email Address: office@cs.du.ac.in, head@cs.du.ac.in

INDEX

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.

The department runs two postgraduate courses MCA & M.Sc. (Computer Science) and also offers full time Ph.D. Program.

The department also monitors following CBCS courses offered by constituent colleges of University of Delhi:

B.Sc. (Hons.) Computer Science
Computer Science in B.Sc. (Programme)
Computer Application in B.A. Programme
Mathematical Sciences in B.Sc (Prog.)
General Elective for students other than B.Sc. (Hons.) / 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 MCA courses in India. The department is proud of its more than 1000 alumni at important positions in Information Technology industry and academia 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.

Doctor of Philosophy (Ph.D. Computer Science)

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.

IMPORTANT DATES AND TIMINGS

Online Availability of Application Forms

Last Date for Online Submission of Application Forms

Check http://du.ac.in for Updates

Master of Computer Applications

Date of Entrance Test   19/06/2016 (Sunday)

Reporting Time for Entrance Test   11:30 AM

Time for Entrance Test   12:00 PM - 02:00 PM

Interview Schedule   Check http://du.ac.in, http://cs.du.ac.in for Updates

M.Sc. Computer Science

Date of Entrance Test   20/06/2016 (Monday)

Reporting Time for Entrance Test   07:30 AM

Time for Entrance Test   08:00 AM – 10:00 AM

Interview Schedule   Check http://du.ac.in, http://cs.du.ac.in for Updates

ELIGIBILITY CONDITIONS

- **Master of Computer Applications (MCA)**

Examination Passed

Any bachelor degree from the University of Delhi or *any other University whose examination is recognized as equivalent to University of Delhi* with at least one paper in Mathematical Sciences (Mathematics, Computer Science, Statistics, Operational Research) under annual mode/at least two papers in Mathematical Sciences (Mathematics, Computer Science, Statistics, Operational Research) in semester mode or an equivalent degree.

Minimum Percentage Required:

60% marks in aggregate. The candidates who are appearing in the final year examinations of the degree on the basis of which admission is sought are also eligible to apply *(Relaxation will be given to the candidates belonging to SC, ST and OBC category as per the University rules).*

- **M.Sc. Computer Science**

Examination Passed

1. 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 *(Relaxation will be given to the candidates belonging to SC, ST and OBC category as per the University rules).*

2. 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 *(Relaxation will be given to the candidates belonging to SC, ST and OBC category as per the University rules).*

3. Any Bachelor's Degree (10+2+3) of University of Delhi with at least six papers in Computer Science and two papers in Mathematics under Semester system/at least three papers in Computer Science and one paper 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 the aggregate with 60% marks in Computer Science and Mathematics separately. *(Relaxation will be given to the candidates belonging to SC, ST and OBC category as per the University rules)*

Note: The candidates who are appearing in the final year examinations of the *Bachelor's Degree* on the basis of which admission is sought are also eligible to apply in all categories mentioned above.

RELAXATIONS

- **Scheduled Caste/ Scheduled Tribe**

  The minimum eligibility requirement for the Scheduled Caste/ Scheduled Tribe candidates will be that they must have passed the qualifying degree examination. Provided that the minimum eligibility for admission to post-graduate courses be the minimum pass marks of the qualifying examination of the University of Delhi. In the case of Scheduled Castes/ Scheduled Tribes candidates who had passed the last qualifying examination from other universities, they should have secured at least the same percentage of pass marks at the qualifying examination as prescribed for the equivalent examination of Delhi University for purposes of admission to the Post-graduate courses of this University.

  That where the admission is based on screening/written test, post-graduate courses, the Scheduled Castes/ Scheduled Tribes candidates would be required to take the test but their merit list be drawn separately and permitted as per the reservation quota.

- **Other Backward Classes**

  The OBC candidates shall be given a relaxation in the minimum eligibility in the qualifying examination and in the minimum eligibility (if any) in the admission entrance test to the extent of 10% of the minimum eligibility marks prescribed for the General Category candidates. For example, if the minimum eligibility for admission to a course is 60% for the General Category candidates, the minimum eligibility for the OBCs would be 54% i.e. (60% minus 10% of 60%) and if the minimum eligibility in entrance test is 40% for General Category candidates, the minimum eligibility for OBCs would be 36% i.e. (40% minus 10% of 40%).

  All those OBC candidates who meet the minimum eligibility marks in the qualifying examination and the minimum eligibility marks (if any) in the entrance test shall be eligible for admission in the order of their merit, keeping in view the availability of seats reserved for them.

  The OBC candidates who belong to the '*Non-Creamy Layer*' and whose castes appear in the *Central List* of the OBCs only shall be eligible to be considered for admission under the OBC Category.

- **Supernumerary Seats**

  ✓ *Persons with Different Ability (PWD)*
  The PWD candidates with not less than 40% disability shall be given a relaxation in the minimum eligibility in the qualifying examination and in the minimum eligibility (if any) in the admission entrance test to the extent of 5%.

  ✓ *Children/Widows of the eligible Armed Forces Personnel (CW)*
  A concession of 5% marks in the minimum eligibility requirements in the qualifying examinations.

RESERVATIONS

- **Scheduled Caste/ Scheduled Tribe/ Other Backward Classes**

Reservation of seats in admissions to various post-graduate courses shall be in the following manner:

Schedule Caste = 15% (07 Seats) of total intake in each course
Schedule Tribe = 7 ½ % (03 Seats) of total intake in each course
Other Backward Classes = 27% (12 Seats) of total intake in each course

The seats reserved for the SC/ST shall be filled by the SC/ST candidates only. However, in the case of non-availability of the eligible candidates the reserved seats may be interchanged between the SC & ST. If still any seat remains unfilled, the same shall be left vacant.

The seats reserved for the OBCs, shall be filled with the OBC students only. Only if OBC candidates possessing the minimum eligibility marks are not available in the OBC category then the vacant OBC seats shall be converted into General Category seats in accordance with the admission schedule notified by the University.

- **Supernumerary Seats**

  - *Persons with Different Ability (PWD)*

    3% (01 Seat) of total intake (1% each for the persons with low vision or blindness, hearing impaired and loco motor disability or cerebral palsy) (interchangeable in case of non- availability of candidates in the sub-categories).

  - *Children/Widows of the eligible Armed Forces Personnel (CW Category)*

    5% (02 Seats) of the seats in each course.

    As per the guidelines approved by the Academic Council, admissions of candidates belonging to CW categories have to be made in the following order of priorities:

    - Widows/Wards of Defence personnel killed in action;
    - Wards of serving personnel and ex-servicemen disabled in action;
    - Widows/Wards of Defence personnel who died in peace time with death attributable to military service;
    - Wards of Defence personnel disabled in peace time with disability attributable to the military service; and
    - Wards of Ex-servicemen personnel and serving personnel including personnel of police forces who are in receipt of Gallantry Awards;

    Category-V (Gallantry Awards) include: Param Vir Chakra, Ashok Chakra, Sarvottam Yudh Seva Medal, Maha Vir Chakra, Kirti Chakra, Uttam Yudh Seva Medal, Vir Chakra, Shaurya Chakra, Yudh Seva Medal, Sena, Nau Sena,

Vayusena Medal, Mention-in-Despatches, President's Police Medal for Gallantry, Police Medal for Gallantry.

Authorities Competent to issue certificates under CW category:

- Secretary, Kendriya, Sainik Board, Delhi
- Secretary, Rajya Zila Sainik Board
- Office-in-Charge, Records Office
- 1st Class Stipendiary Magistrate
- Ministry of Home Affairs (for Police personnel in receipt of Gallantry Awards)

- *Foreign Nationals* = 5% (02 Seats) seats in first year of each course.

The foreign nationals seeking admission in the University/its colleges shall have to get themselves registered with the Foreign Students Registry in compliance with the Schedule notified by the FSR. No Foreign students will be admitted directly by the Department/Colleges.

- *Sports Persons* = up to 5% (02 Seats) of total intake in each course.

Admission under these categories shall be made in accordance with the guidelines issued by the Sports Council, University of Delhi from time to time.

MERIT LIST

The merit list for the general category seats will comprise of all the candidates in the order of merit. It will also include SC/ST/OBC candidates if they come in the general merit. Admission to general category seats will be strictly in the order of merit without excluding SC/ST/OBC candidates.

CERTIFICATE REQUIREMENT

At the time of admission all certificate are to be produced in original and one set photocopy of self-attested certificates.

CERTIFICATES REQUIRED FOR RESERVED CATEGORIES

A candidate applying for any reserved seat mentioned in the previous section is required to submit the following certificate as the case may be:

- *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:

  1. 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.

  2. Chief Presidency Magistrate/Additional Chief Presidency Magistrate/ Presidency Magistrate.

  3. Revenue Officer not below the rank of Tehsildar.

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

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

- Entitlement Card/Certificate: The candidates under CW category will be required to provide attested photocopy of Entitlement Card/Certificate from the competent authority.

- Certificate for Differently abled (PWD) Candidates: For admission to a seat reserved for physically 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 Test. 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:

1. The certificate should not be more than 5 years old.

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

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

4. Diagnosis should be written clearly in the certificate.

The original certificate as mentioned above in the above points would be required to be produced for verification at the time of admission.

ENROLMENT IN SEVERAL COURSES

As per A.C. Resolution 40 dated 24/04/1997, no student of the University shall be permitted to pursue two degree courses simultaneously either from the University of Delhi or from other University except the part-time diplomas/certificates of the University of Delhi.

APPLICATION FEE

MCA/M.Sc. Computer Science   Rs.500/- for General/OBC Category
                                      Rs.250/- for SC/ST/PWD Category

Mode of Payment   On-Line Payment

ADMISSION TICKET

Check **http://du.ac.in** for latest updates.

AGE REQUIREMENT

As per Ordinance I of the University, there is no minimum age bar for admission to the under-graduate and post-graduate courses in the University and its colleges except in the courses where the respective regulatory bodies (such as MCI, AICTE) have prescribed the minimum age requirement in their regulations.

ADMISSION OF FOREIGN NATIONALS

- Foreign nationals shall be exempted from appearing in Admission Entrance Test conducted by the College/Department for admission to various Under-Graduate and Post-Graduate Courses including Professional Courses. Foreign nationals who are stationed in India have passed last examination from Board/University in India shall also be exempted from appearing in entrance test conducted by the College/Department in all Courses.

- All the Categories of foreign students shall come under the same category of 5% quota for foreign nationals for admission to Under-Graduate, Post-Graduate and other Course. This shall include foreign nationals with qualifications attained either from Indian Board/University or Foreign Board/University.

- All admission in Foreign Students category shall be done on individual merit and a single merit list of foreign students, both with India and foreign qualifications shall be prepared for admission in various courses.

- At least one seat shall be reserved for foreign nationals in all Post-Graduate courses wherever the total numbers of seats for admission is less than 20.

Foreign students are advised to submit TOFEL/IELTS Score.

ADMISSION PROCEDURE

- ## Master of Computer Applications (MCA)

Admission to MCA course is based on Entrance Test and Interview. For preparing the final merit list, 85% weightage will be given to the score in the Entrance Test and 15% weightage will be given to the score of the Interview. *The entrance examination shall be of Two hours duration. Question paper shall be of 280 marks. The paper will consist of 70 Multiple Choice Questions having exactly one correct answer. For each correct answer 4 marks will be given and for an incorrect answer there is a negative marking of 1 mark.*

Entrance Test shall consist of objective type questions from the following three components:

1. Mathematical Ability (40 Questions)
2. Computer Science (05 Questions)
3. English Comprehension (05 Questions)
4. Logical Reasoning (20 Questions)

- ## M.Sc. Computer Science

Mode I: 50% of the seats will be filled on the basis of merit in B.Sc. (H) Computer Science Examination of University of Delhi. Students with gap year will be considered. Only those students who have filled the application form will be considered under this category.

Note: Only Delhi University students are eligible for admissions on the basis of merit.

Mode II: The admission for the remaining 50% seats in the M.Sc. Computer Science course is based on Admission Test which will consist of two parts:

If any seat remains vacant against direct admission category due to non-availability of eligible candidates, the same shall be transferred and filled through admission entrance test. If a candidate is shortlisted in both the categories, he/she will be admitted in Mode I. Any future withdrawals will not change the category of a candidate already admitted.

Entrance Test will consist of the following:

1. Computer Science (50 Questions)
2. English Comprehension (05 Questions)
3. Mathematics (15 Questions)

PROGRAM STRUCTURE

The details are available at the links mentioned:

- MCA Structure ::
  http://du.ac.in/du/uploads/pg-courses/mca_syl_09.pdf

- M.Sc. Computer Science Structure ::
  http://du.ac.in/du/uploads/pg-courses/msc%20comp-sc_syl_09.pdf

PROGRAM FEE

Course fees for MCA of Rs. 9,670/- and for M.Sc. Computer Science of Rs. 9,620/- per semester shall be charged over and above the normal University fees.

NUMBER OF SEATS

The number of sanctioned seats in each of the programs MCA/M.Sc. (Computer Science) is 46.

Master of Computer Applications								
Mode of Admission	Distribution of Seats							
	GEN	SC	ST	OBC	PWD 3%	CW 5%	Sports Upto 5%	Foreign Nationals
Direct	0	0	0	0	0	0	0	2
Entrance	24	7	3	12	1	2	2	0

M.Sc. Computer Science								
Mode of Admission	Distribution of Seats							
	GEN	SC	ST	OBC	PWD 3%	CW 5%	Sports Upto 5%	Foreign Nationals
Direct	12	3	2	6	0	1	1	2
Entrance	12	3	2	6	1	1	1	0

Note:

Total No. of Seats = GEN+SC+ST+OBC
Supernumerary Seats (PWD, CW, Sports, and Foreign Nationals) are over and above the total no. of seats.

HOSTEL ACCOMMODATION

The details are available at the following link:
http://www.du.ac.in/du/index.php?page=hostels

LIBRARY

The University has a rich and up-to-date collection of books for use by the students and the faculty members. (http://csl.du.ac.in/)

COMPUTING FACILITIES

Students and faculty members make active use of the computer systems at Department of Computer Science (http://cs.du.ac.in/) and Delhi University Computer Centre (http://ducc.du.ac.in/). The department also has up-to- date digital and microprocessor labs.

PLACEMENT CELL

The Department and the University has a Placement Cell (http://placement.du.ac.in/) which invites leading companies from the IT industry for the campus recruitment. The department has had an excellent track record of 100 % placement for several years.

IMPORTANT POINTS

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

- 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.

- 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.

- There is no direct admission to the 2nd or 3rd year of the MCA/Second Year of M.Sc. Computer Science course.

INSTRUCTIONS FOR ENTRANCE TEST

- All candidates will take their seat as per time schedule mentioned on Page No. 2 (Important Dates & Timing) given in the schedule.

- Candidates will write particulars on the cover page of the booklet using ball pen, without breaking the seal of the test booklet.

- Breaking open the seal of the Question/Test booklet: On instruction from the invigilator, the candidates will take out the OMR-answer-sheet without breaking the seal of Test booklet. 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. 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 Optical Marks Scanner.

- Late Entry: The entry in the Examination Hall will not be allowed after the start of the test i.e. 10.00 A.M. Thereafter all doors will be closed and no candidate will be permitted entry in the Examination Hall. Candidates are advised to reach the Centre well before the reporting time.

- 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.

- Answer Sheet and Checking of Serial Number: The OMR-answer sheet 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 OMR- answer sheet. In such an event, the candidate will be given a new Test booklet. In any case, the candidate must not use an OMR-answer sheet which has a serial number different from the one given on the test booklet.

- 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 OMR-answer sheet or any other material. The candidate will not bring any loose sheet for rough work. Use of any calculating device is not allowed.

- Test booklet should be unsealed by the Candidate only after the announcement by the Invigilator.

- The OMR-Answer Sheet will be collected from the candidate after the Test is over.

- The answers are to be given in the first one hundred slots of the OMR- answer-sheet only and NOT in the Test Booklet.

- Do not start writing answers until you are asked to do so. Mark the answer immediately on solving the question.

- 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.

- 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.

- Use of any calculating device like calculator or mathematical tables is not allowed.

- No candidate will be allowed to take the question booklet and carbon copy of the OMR sheet before the examination is over.

- Eatables/smoking is not allowed in the Examination Hall/Room.

- 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 Test may also vary.

- Don't bring your Mobile Phones or any other digital devices in the Examination Hall.

SYLLABUS FOR THE ENTRANCE TEST

- ## Master of Computer Applications (MCA)

The test will comprise one hundred question of the objective type from the following syllabus.

Entrance Test shall have the following components: Mathematical Ability, Computer Science, Logical Reasoning and English Comprehension. Syllabus for entrance test 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.

English Comprehension: Correct usage of English Language and Reading comprehension.

- ## M.Sc. Computer Science

The syllabus for the M.Sc. (Computer Science) 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 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 normal, 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 F distributions, test of significance based on t, Chi-square and F distributions.

English Comprehension

Correct usage of English language and reading comprehension.

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. J. F. Blake, An Introduction to Applied Probability, John Wiley.
- R. S. Pressman, Software Engineering: A Practitionr's Approach McGraw Hill.
- Silberschatz, P.B. and Greg Gargne, Galvin. Operating System Concepts, John Wiley.
- 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.

JURISDICTION OF STATUTORY AUTHORITIES

Information contained in this bulletin is subject to any subsequent directives of the statutory authorities.

SAMPLE QUESTIONS

- **Master of Computer Applications (MCA)**

1. The nth derivative of xe^x is:

   (a) $(x + n) e^x$
   (b) $nx\, e^x$

   (c) $x^n e^x$
   (d) $x\, e^{nx}$

2. The Taylor Series of $e^x \cos x$ is:

   (a) $1 + x + \frac{x^3}{3} + \frac{x^4}{6} + \cdots$
   (b) $1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \cdots$

   (c) $1 + x - \frac{x^3}{3} - \frac{x^4}{6} + \cdots$
   (d) $1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \cdots$

3. The Function $f(x) = \begin{cases} x, & x \text{ is Rational} \\ 0, & x \text{ is Irrational} \end{cases}$ is:

   (a) Continuous at all points in R
   (b) Continuous nowhere

   (c) Continuous only at x=0
   (d) Continuous at all Rational x

4. If a differential function $f : [0, 5] \to \mathbb{R}$ vanishes at x = 0, 1, 2, 3, 4, 5 then the equation $f'(x) = 0$ has:

   (a) Exactly one solution
   (b) No Solution

   (c) Five or more solutions
   (d) Exactly Six Solutions

5. Which one of the following is countable?

   (a) $\mathbb{R} \setminus \mathbb{Q}$
   (b) $\mathbb{Q} \setminus \mathbb{Z}$

   (c) $\mathbb{R} \setminus \mathbb{Z}$
   (d) $\mathbb{R} \setminus \mathbb{N}$

6. Which one of the following is false in general?

   (a) Monotonically increasing bounded sequence converges

   (b) Monotonically decreasing bounded sequence converges

   (c) Convergent monotone sequence is bounded

   (d) Monotonically increasing sequence is bounded

7. Consider the sequence of function $f_n : [0, 1) \to \mathbb{R}$ definded by $f_n(x) = \frac{1}{nx+1}$

   (n = 1, 2, 3, …)

   (a) $< f_n >$ does not converge

   (b) $< f_n >$ converges but not uniformly

   (c) $< f_n >$ converges uniformly

(d) < f_n > converges monotonically and uniformly

8. The Radius of convergence of the series $\sum_{n=0}^{\infty} \frac{x^n}{2^{n+1}}$ is:

    (1) 0   (2)   1

    (3) 2   (4)   ∞

9. The series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$

    (a) log2   (b)   -log2

    (c) 0   (d) $\frac{\pi}{2}$

10. The set of natural numbers ℕ = {1, 2, 3, …}

    (a) Is not closed under addition

    (b) Has no identity element for multiplication

    (c) Is commutative under both addition and multiplication

    (d) Is a group under multiplication

11. The identity element in the group of positive rational numbers under the binary operation $a * b = \frac{ab}{2}$ is:

    (a) 0   (b)   1

    (c) 2   (d) $\sqrt{2}$

12. Lagrange theorem is the following statement about a finite group G:

    (a) Order of an element divides order of G

    (b) Order of any subgroup divided order of G

    (c) Sum of orders of elements in G the order of G

    (d) Order of G equals order of identity element

13. If H_1, H_2 are subgroups of a group G, then:

    (a) $H_1 \cup H_2$ is a subgroup of G   (b) $H_1 \cap H_2$ is a subgroup of G

    (c) $H_1 \setminus H_2$ is a subgroup of G   (d) $H_1 H_2$ is a subgroup of G

14. Let H be a subgroup of a group G. then G/H is defined except possibly when:

    (a) G is Abelian   (b)   G is cyclic

    (c) G is a group of Prime order   (d)   G is Non-Abelian.

15.   Which one of the following is not a ring with respect to usual addition and multiplication?

(a) The set of even integers

(b) The set of integers which are multiple of 3

(c) The set of positive integers

(d) The set of integers

16.   In the ring $\mathbb{Z}_{10}$, the divisor of 0 is:

(a) 1   (b)   2

(c) 3   (d)   7

17.   Which one of the following is not a field?

(a) $\mathbb{Z}_2$ (b) $\mathbb{Z}_3$

(c) $\mathbb{Z}_4$ (d) $\mathbb{Z}_5$

18.   The remainder of 8^{103} when divided by 13 is:

(a) 2   (b)   3

(c) 4   (d)   5

19.   The dimension of the vector space spanned by the vectors { (1,0,0), (1,1,1), (1,2,0) } is:

(a) 0   (b)   1

(c) 2   (d)   3

20.   Consider the Linear Transformation $T(f) = \dfrac{d^3 f}{dt^3}$ on the space V of all real polynomials in t. What is the kernel of T?

(a) { f ∈ V : deg f ≤ 1 }   (b)   { f ∈ V : deg f ≤ 2}

(c) { f ∈ V : deg f ≤ 3}   (d) { f ∈ V : deg f ≤ 4}

21.   The Linear Transformation T : $\mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by T(x,y,z) = (x+y,y,z) is:

(a) One-to-One but not onto   (b)   Onto but not One-to-One

(c) Both One-to-One and onto   (d)   Neither One-to-One nor onto

22.   Which one of the following is Linearly Independent?

(a) { (0,0,0), (1,1,1) }   (b)   { (0,1,1), (0,2,2), (0,3,3) }

(c) { (1,0,0), (0,1,0), (1,1,1) }   (d)   { (0,1,1), (0,2,2) }

23.   The equation $ax^2 + 3xy - 2y^2 - 5x + 5y + c = 0$ represents two straight lines perpendicular to each other if:

(a) a = 2, c = -3   (b)   a = -2, c = 3

(c) a = -3, c = 2   (d)   a = 3, c = -2

24. Which one of the following equations represents a circle?

(a) $(x - 1)(x - 2) + (y - 3)(y - 4) = 0$ (b) $2x + 3y = 0$

(c) $9x^2 + 4y^2 = 36$ (d) $y^2 - 4(x - 9) = 0$

25. The length of the latus rectum of the parabola $9x^2 + 24xy + 16y^2 + 8x - 6y + 3 = 0$ is:

(a) 2/5   (b) 1/5

(c) 3/5   (d) 5/2

26. In the hyperbola $4x^2 - 9y^2 = 36$, the eccentricity e and the latus rectum l are:

(a) $e = 1/3, l = 8/3$ (b) $e = \sqrt{13}/3, l = 8/3$

(c) $e = 8/3, l = \sqrt{13}/3$ (d) $e = -8/3, l = -\sqrt{13}/3$

27. A particle is moving along the parabola $y^2 = 12x$ at the uniform rate of 10cm/sec, then the component of velocity (in cm) parallel to x-axis when the particle is at the point (3,6) is:

(a) $5\sqrt{2}$ (b) $3\sqrt{2}$

(c) $2\sqrt{3}$ (d) $5\sqrt{3}$

28. The tangent to the curve $y^2 = x(2 - x)^2$ at (1,1) meets the curve again at a point whose abscissa is:

(a) 9/4   (b) 9/2

(c) 3/4   (d) 3/2

29. Let G be the set 3 x 3 matrices having integer entries and a nonzero determinant. Then, under matrix multiplication, G is:

(a) A Group

(b) Not a group because closure property gets violated

(c) Not a group because inverse of an element does not exist in it

(d) Not a group because the identity element is not present in it

30. For Which one of the following groups, the converse of Lagrange's Theorem is not generally satisfied?

(a) Permutation group S_4 (b) All Abelian groups

(c) All groups of order 8   (d) All groups of order 12

31. Let G = $\left\{ \begin{pmatrix} 1 & 0 & 0 \\ x & 1 & 0 \\ y & z & 1 \end{pmatrix} : x, y, z \in \mathbb{Z}_3 \right\}$, where $\mathbb{Z}_3$ denotes integer modulo 3.

Then, which of the following statement is NOT TRUE in group G?

(a) G is not an Abelian group

(b) Order of each element in G is 3

(c) Order of G is 27

(d) $\exists$ A, B $\in$ G such that $(AB)^4 \neq A^4 B^4$

32. Which of the following statement is NOT TRUE for the polynomial f(x) = $x^2 + x + 1$?

(a) It is irreducible over the field of integer modulo 2

(b) It is reducible over the field of integers mod 3

(c) It is reducible over the field of integers modulo 5

(d) It is reducible over the field of integers modulo 7

33. The partial differential equation $\frac{\partial w}{\partial t} + \frac{\partial^3 w}{\partial x} - w \frac{\partial w}{\partial x} = 0$ is:

(a) Nonlinear and first order

(b) Nonlinear and third order

(c) Linear and third order

(d) Linear and first order

34. Consider the two differential equations:

(D_1) $x^2 + xy + (y^2 - xy)y' = 0$, (D_2) $ye^{xy} - 2x + (xe^{2xy} + \cos y)y' = 0$.

Statement I: (D_1) is exact.

Statement II: (D_2) is not exact. Then:

(a) Both statements are false

(b) Both statements are true

(c) Only statement I is true

(d) Only statement II is true

35. The value of $\left(\dfrac{1 + sin\left(\frac{\pi}{8}\right) + i\, cos\left(\frac{\pi}{8}\right)}{1 + sin\left(\frac{\pi}{8}\right) - i\, cos\left(\frac{\pi}{8}\right)} \right)^8$

(a) I

(b) $-i$

(c) -1

(d) 1

36. If $(\sqrt{3} + i)^{100} = 2^{99} (a + ib)$, then $a^2 + b^2$ is equal to:

(a) 1

(b) 2

(c) 3

(d) 4

37. The locus of z = x + iy is satisfying $\left| \frac{z+1}{z-1} \right| = \sqrt{5}$, z $\neq$ 1, is a circle with:

(a) Center (1.5, 0) and radius $\sqrt{3.5}$

(b) Center (1.5, 0) and radius 1

(c) Center (0, 1.5) and radius $\sqrt{3.5}$

(d) Center (0, 1.5) and radius 1

38. Let f: $\mathbb{R} \to \mathbb{R}$ be given by $f(x) = \begin{cases} \frac{x}{x+1}, & x \geq 0 \\ \frac{x}{1-x}, & x < 0 \end{cases}$

Then, which of the following statement is NOT TRUE?

(a) f is continuous

(b) f is unbounded

(c) f(x) = 0 has a unique solution

(d) f is monotonically increasing

39. The area (in sq. units) of the region described by the set A = { (x, y) ∈ $\mathbb{R}^2$: y ≤ 2, : $y \geq |x - 2|$}, is

(a) 1

(b) 2

(c) 4

(d) 8

40. If the normal at one end of the rectum of the ellipse $\frac{x^2}{8} + \frac{y^2}{b^2} = 1$ passes through the extremity of its minor axis, then b^2 is equal to:

(a) $3 - \sqrt{5}$

(b) $6 - \sqrt{5}$

(c) $2 (3 - \sqrt{5})$

(d) $4 (3 - \sqrt{5})$

41. If a = 1, b = 0, c = 5, what is the value of the expression a && b || c?

(a) 5

(b) 7

(c) 6

(d) 0

42. Which of the following is not a logical operator?

(a) ||

(b) ==

(c) !=

(d) =

43. How many times will the following loop execute?

while(1)

{   printf("%d",1);   }

(a) 0 Time

(b) 1 Time

(c) Infinite Times

(d) Finite Time

44. What is the output of the following operation in C language?

128 << 1

(a) 16

(b) 64

(c) 32

(d) 0

45. Which one of the following is not correct?

(a) Memory address + Number = Memory Adress

(b) Memory Adress1 + Memory Adress2 = Memory Adress3

(c) Memory Adress1 * Memory Adress2 = Memory Adress3

(d) Memory Adress1 – Number = Memory Address

Direction for Q46 - Q50: Read following passage and based on it give the best possible answer to the questions:

Imagination shows itself when a child is still very young. This is the age of make-believe when children like to hear stories of impossible things such as magic carpets which carry their owners wherever they want to go, talking animals, &c. At this stage they have great difficulty in seeing any difference between real thing and imagined things, due to lack of experiences (sensations). A good teacher will not mistake this imagination for real lying, but will watch carefully for any tendency for it to develop that way, e.g.,

(a) One asks a child if he took food from the kitchen, and he says, 'No, I did not, 'although the food still shows around his mouth. That is lying.
(b) One asks a child if he has seen one's pencil anywhere, and he, trying to be helpful, says, 'I think I saw a dog running away with it.' That is imagination.

Later, when children have had more experiences, they –particularly boys-tend to regard such make-believe stories as babyish, and profess to show a fine scorn for them. They want exciting stories of hunting, of brave men and women, and the like.

This is the ideal time to present to them, in an interesting way, History, Geography, and Literature: Stories of people, their way of living, how they get their food, what their ancestors did, and great adventures of the past. The approach through facts and figures and dates will kill the natural interest provided by the development of their imagination. The teacher who knows a little about the working of the mind will not make this mistake. Much of the dislike for history and Geography that one often meets in children is due to the dull, plodding way in which many teachers tackle these subjects. They can be made very exciting.

46.   When children are _____ they like to hear stories of impossible things.

(a) Young   (b) Very Young

(c) Grow Up   (d) 8-10 Years

47.   The difficult in seeing the difference between real and imagined things is due to:

(a) Lack of Understanding   (b) Lack of Adventure

(c) Lack of Experience   (d) Lack of Imagination

48.   The meaning of the word 'Scorn' in the text is:

(a) Reject   (b) Accept

(c) Snub   (d) Legal

49.   One hates History subject as it is:

(a) Not taught properly   (b) Difficult to memorize the lessons

(c) Has volumeness books   (d) Has tough language

50.   What is the best title of the paragraph?

(a) Experience   (b) Imagination

(c) Children   (d) Skittle

51.   If KEDGY is coded as EKDYG then how will LIGHT be coded?

(a) ILHTG   (b) ILGHT

(c) ILGTH   (d) THGIL

52.   In the question given below one word is different from the rest. Find out the word which does not belong to the group?

(a) GTSH   (b) BYXC

(c) ETUF   (d) LONM

53.   If the numbers which are divisible by 4, from 4 to 84 are written in reverse order then which number will be at the 7th place?

(a) 60   (b) 28

(c) 20   (d) 32

54.   Which conclusion on the basis of given statements is logically valid?

Statement I: All laborers are wrestlers.

All grocers are laborers

Conclusions: I. All grocers are wrestlers.

II. Some wrestlers are grocers

III. Some wrestlers are laborers

IV. Some laborers are grocers.

(a) All   (b) Only IV

(c) Only I & IV   (d) Only II & III

55.   If + means /, / means -, - means x, and x means + then,

64 + 8 / 6 – 4 x 2 = ?

(a) 34   (b) -14

(c) 16   (d) 24

56. Danger always involves:

(a) Help (b) Fear

(c) Attack (d) Enemy

57. A man sold a chair and a table together for Rs. 1520 thereby making profit of 25% on the chair and 10% on table. By selling them together for Rs. 1535, he would have made a profit of 10% on the chair and 25% on the table. The cost of a table is:

(a) Rs. 500 (b) Rs. 600

(c) Rs. 700 (d) Rs. 800

58. Manoj travels 600 km to his home partly by train and partly by car. He takes 8 hours if he travels 120 km by train and the rest by car. He takes 20 minutes longer if he travels 200 km by train and the rest by car. The speed of the car is:

(a) 40 km/hr (b) 60 km/hr

(c) 80 km/hr (d) 100 km/hr

59. Rajan takes 3 hours more than Sanjay to walk 30 km. But, if Rajan doubles his pace, he is ahead of Sanjay by _____ hours when the ratio of speeds of Rajan and Sanjay is 2:3.

(a) 1.5 hours (b) 2 hours

(c) 2.5 hours (d) 3 hours

60. Mohit and Sohan are friends and their ages differ by 2 years. Mohit's father MF is twice old as Mohit and Sohan is twice as old as his sister Ss. The age of Mf and Ss differ by 40 years. The age of Sohan is:

(a) 25 years 4 months (b) 27 years 4 months

(c) 28 years 4 months (d) 29 years 4 months

61. In a two digit number, the unit's digit is twice the ten's digit. If 27 is added to the number, the digits interchange their places. The number is:

(a) 48 (b) 36

(c) 24 (d) 12

62. 90% and 97% pure acid solutions are mixed to obtain 21 liters of 95% pure acid solution. Find the amount of each type of acid to be mixed to form the mixture.

(a) 6 liters, 15 liters (b) 8 liters, 20 liters

(c) 10 liters, 25 liters (d) 12 liters, 20 liters

63. A man is engaged for 70 days. He is to receive Rs. 24 per day when he works but has to pay a fine of Rs. 6 for every day that he is absent. He receives altogether Rs. 1230. How many days he was absent?

   (a) 5 (b) 10
   (c) 15 (d) 20

64. Solve for x, $x = \cfrac{1}{1 - \cfrac{1}{2 - \cfrac{1}{2 - \cfrac{1}{2 - x}}}}$

   (a) 0.2 (b) 0.3
   (c) 0.4 (d) None of the Above

65. The sum of all odd integers between 2 and 100 which are divisible by 3 is:

   (a) 969 (b) 867
   (c) 676 (d) 770

66. A golf ball has a diameter equal to 4.1cm. Its surface has 150 dimples each of radius 2 mm. the total surface area exposed to the surroundings, assuming that the dimples are hemispherical, is:

   (a) 68.72 sq cm (b) 71.68 sq cm
   (c) 86.72 sq cm (d) 77.86 sq cm

67. Let r_1 and r_2 be the radii of the two solid metallic spheres and if they are melted into one solid sphere, then the radius of the new sphere is:

   (a) $\sqrt[2]{r_1^3 + r_2^3}$ (b) $\sqrt[2]{r_1^2 + r_2^2}$
   (c) $\sqrt[3]{r_1^2 + r_2^2}$ (d) $\sqrt[3]{r_1^3 + r_2^3}$

68. A solid metal sphere of 6 cm diameter is melted and a circular sheet of thickness 1 cm is prepared. The diameter of the sheet is:

   (a) 3 cm (b) 6 cm
   (c) 12 cm (d) 15 cm

69. The 6th term of the series 1, 4, 11, 19, 29 is:

   (a) 35 (b) 55
   (c) 45 (d) None of the Above

70. If the second half of the series is written in the reverse order then which will be the 9th letter to the right of 7th letter from your left?

   (a) Y (b) P
   (c) Z (d) X

- **M.Sc. Computer Science**

1. Running two or more programs concurrently is called _____.

    (a) Multitasking

    (b) Short Cutting

    (c) Multiprocessing

    (d) It is not possible to run 2 or more programs concurrently

2. Which one of the following is commercially successful graphical uses interface?

    (a) MS-DOS   (b) UNIX

    (c) Windows   (d) The Apple Macintosh

3. In critical path method, slack time defined as:

    (a) The difference between completion time and stating time for that activity.

    (b) The difference between completion time and waiting time and waiting time for that activity.

    (c) The difference between the available time and the real time for that activity.

    (d) The difference between the available time and waiting time.

4. If there are n workers in project, then there are _____ pairs of communication.

    (a) n/2   (b) n(n-1)/2

    (c) (n-1)/2   (d) n(n-1)

5. A graph is _____ if each pair of distinct vertices has a path between them.

    (a) Complete   (b) Disconnected

    (c) Connected   (d) Full

6. The maximum height of a Binary tree of n nodes is _____.

    (a) n   (b) (n/2) - 2

    (c) n/2   (d) $\lceil log_2 (n + 1)\rceil$

7. X.25 is the standard protocol used for traditional _____ networks.

    (a) Circuit Switching   (b) Packet Switching

    (c) Virtual   (d) Subscriber Loop

8. A Datagram is associated with _____.

   (a) Packet-Switched Network   (b) Circuit-Switched Network

   (c) Virtual Circuit   (d) None of the Above.

9. Which of the following is NOT a characteristic of a bridge?

   (a) The bridge makes no modification to the content or format of the frames it receives.

   (b) There may not be more than two LANs interconnected by a number of bridges.

   (c) The bridge should contain enough buffer space to meet peak demands.

   (d) The bridge must contain addressing and routing intelligence.

10. Process management is concerned with efficiently managing _____.

    (a) Memory Space   (b) Peripheral Devices

    (c) The Processor's Time   (d) All of the Above

11. With segmentation, programs are divided into independently addressed segments and stored in:

    (a) Virtual Memory   (b) Contiguous Memory

    (c) Non-Contiguous Memory   (d) None of the Above

12. Which of the following is the most important measure of effectiveness of a time sharing system?

    (a) Security   (b) Turnaround

    (c) Throughput   (d) Response Time

13. The computer system interconnection is done by means of a _____.

    (a) System Bus   (b) Data Transport

    (c) Register   (d) Control Device

14. The _____ measures the ability of a computer to complete a single task.

    (a) Clock Speed   (b) Execute Cycle

    (c) Speed Metric   (d) Cycle Time

15. The _____ are used to designate the source or destination of the data on the data bus.

    (a) Data Lines   (b) System Lines

    (c) Control Lines   (d) Address Lines

16. The effect of the _____ is to erase the portion of the host field that refers to an actual host on a subnet, leaving the network number and the subnet number.

(a) Subnet Mask   (b) Echo Reply

(c) Address Mask   (d) Checksum

17. Connection establishment in TCP always uses a _____.

(a) One-way Handshake   (b) Two-way Handshake

(c) Three-way Handshake   (d) Four-way Handshake

18. A _____ is a program that can replicate itself and send copies from computer to computer across network connections.

(a) Worm   (b) Malicious Software Program

(c) Virus   (d) Security Intrusion Program

19. What happens if a recursive function never reaches a base case?

(a) The function returns the correct value

(b) The function returns an incorrect value

(c) An infinite sequence of recursive calls occurs

(d) The functions terminates immediately

20. In all circular linked lists, _____.

(a) Every node points to a predecessor

(b) Every node points to a successor

(c) The next pointer of the last node has the value NULL

(d) Each node points to both its predecessor and its successor

21. Which of the following is the postfix form of the infix expression?

(a + b) * c / d

(a) ab + c * d /   (b) ab * c / d +

(c) a + b * c / d   (d) ab + cd * /

22. Moving the sign bit to the new leftmost position and filling in with copies of the sigh bit is called _____.

(a) Partial Extension   (b) Range Extension

(c) Bit Extension   (d) Sign Extension

23. A positive exponent exceeds the maximum possible exponent value when:

(a) Significant Overflow   (b) Exponent Overflow

(c) Significant Underflow   (d) Exponent Underflow

24. _____ are used in digital circuits to control signal and data routing.

(a) Multiplexes   (b) Gates

(c) Flip-Flops   (d) Program Counters

25. Individual hosts and LANs are connected to an internet service provider through a _____.

(a) CPE   (b) NSP

(c) POP   (d) NAP

26. Which of the following provides a basic electronic mail transport facility?

(a) TELNET   (b) SMTP

(c) SNMP   (d) UDP

27. When signals at different frequencies share the same transmission medium the result may be _____ noise.

(a) Intermodulation   (b) Crosstalk

(c) White   (d) Impulse

28. _____ occurs when the system finds itself spending so much swapping pages into and out from memory that little time is left for useful work.

(a) Spooling   (b) Thrashing

(c) A Polling Signal   (d) An Interrupt

29. Which of the following is a common technique on a time-sharing system?

(a) Multiprogramming   (b) Demand Paging

(c) Polling   (d) None of the Above

30. A portion of main memory used as a buffer to hold data temporarily is to be read out to disk is referred to as a _____.

(a) Latency   (b) Disk Cache

(c) Virtual Address   (d) Miss

31. Which of the following enables the RAM chip to preposition bits to be placed on the data as rapidly as possible?

(a) RAM Bus   (b) Hamming Code

(c) BUFFER   (d) FLASH MEMORY

32. A communication _____ is a microwave relay station used to link two or more ground based microwave transmitter/receivers known as Earth stations.

   (a) Transponder   (b) Dish

   (c) Transmitter   (d) Satellite

33. In a data link, _____ control is achieved by retransmission of damaged frames.

   (a) DLHC   (b) Error

   (c) Data   (d) Flow

34. The _____ accepts the multiplexed data stream, separates the data according to channel, and delivers data to the appropriate output lines.

   (a) Coaxial Link   (b) Multiplexer

   (c) High Capacity Fiber   (d) De-Multiplexer

35. Scanning information at the same rate by rotating the disk at a fixed speed is known as the _____.

   (a) Constant Angular Velocity   (b) Rotational Delay

   (c) Magneto-Resistive   (d) Constant Linear Velocity

36. The _____ command causes the I/O module to take an item of data from the data bus and subsequently transmit that data item to the peripheral.

   (a) Write   (b) Read

   (c) Test   (d) Control

37. _____ is a function of the number of failures experienced by a particular user of that software.

   (a) Software Reliability   (b) Software Performance

   (c) Software Usability   (d) None of the Above

38. The incremental model of software development is:

   (a) A good approach when a working core product is required quickly.

   (b) A reasonable approach when requirements are well defined.

   (c) The best approach to use for projects with large developments clearly.

   (d) A revolutionary model that is not used for commercial products.

39. Which one of these is not the name of a C library Function?

(a) void   (b) sqrt

(c) printf   (d) log

40. Consider the following program segment:

```
int z = 0;
int g = 0;
int s = 0;
int i = 0;
while ( i < 50 ) {
    scanf("%d", &t);
    s = s+t;
    if ( t > 0 )
            g = g+1;
    else
            z = z+1;
    i = i+1;
}
```

How many times is the loop body of the while statement executed?

(a) Once   (b) 49 Times

(c) Never   (d) 50 Times

41. The ADT _____ allows you to insert into, delete from and inspect the item at any position of the ADT.

(a) Stack   (b) List

(c) Queue   (d) Circular Queue

42. The _____ compares adjacent items and exchanges them if they are out of order.

(a) Quicksort   (b) Bubble Sort

(c) Selection Sort   (d) Binary Search

43. A sequential access file resembles a(n) _____ in terms of the operations that are permitted on such a file.

(a) Linked List   (b) Array

(c) Stack   (d) Queue

44. A branch instruction in which the branch is always taken is _____.

(a) Conditional Branch   (b) Jump

(c) Unconditional Branch   (d) Bi-Endian

45. Which one of the following must be implemented as trusted software?

(a) Assembler   (b) DBMS

(c) Compiler   (d) Multiprogramming Manager

46. Normalization in a data base system (DBS) is done:

(a) To avoid Updation Anomelies.

(b) To have maximum number of tables in DBS.

(c) To have minimum number of tables in DBS.

(d) To have optimal number of tables in DBS.

47. Analysis models depict software in which three representations?

(a) Information, Function, Behavior

(b) Architecture, Interface, Component

(c) Cost, Risk, Schedule

(d) None of the Above

48. A primary key that consists of more than one attribute is called a _____.

(a) Cardinal Key   (b) Foreign Key

(c) Composite Key   (d) Multivalued Key

49. Distributing the rows of data into separate files is called:

(a) File Allocation   (b) Vertical Partitioning

(c) Normalization   (d) Horizontal Partitioning

50. Indexes are created in most RDBM to:

(a) Increase the cost of implementation.

(b) Provide a quicker way to store data.

(c) Provide rapid random and sequential access to base-table data.

(d) Decrease the amount of disk space utilized.

Direction for Q51 - Q55: Read following passage and based on it give the best possible answer to the questions:

Imagination shows itself when a child is still very young. This is the age of make-believe when children like to hear stories of impossible things such as magic carpets which carry their owners wherever they want to go, talking animals, &c. At this stage they have great difficulty in seeing any difference between real thing and imagined things, due to lack of experiences (sensations). A good teacher will not mistake this imagination for real lying, but will watch carefully for any tendency for it to develop that way, e.g.,

(c) One asks a child if he took food from the kitchen, and he says, 'No, I did not, 'although the food still shows around his mouth. That is lying.
(d) One asks a child if he has seen one's pencil anywhere, and he, trying to be helpful, says, 'I think I saw a dog running away with it.' That is imagination.

Later, when children have had more experiences, they –particularly boys-tend to regard such make-believe stories as babyish, and profess to show a fine scorn for them. They want exciting stories of hunting, of brave men and women, and the like.

This is the ideal time to present to them, in an interesting way, History, Geography, and Literature: Stories of people, their way of living, how they get their food, what their ancestors did, and great adventures of the past. The approach through facts and figures and dates will kill the natural interest provided by the development of their imagination. The teacher who knows a little about the working of the mind will not make this mistake. Much of the dislike for history and Geography that one often meets in children is due to the dull, plodding way in which many teachers tackle these subjects. They can be made very exciting.

51.   When children are _____ they like to hear stories of impossible things.

(a) Young   (b) Very Young

(c) Grow Up   (d) 8-10 Years

52.   The difficult in seeing the difference between real and imagined things is due to:

(a) Lack of Understanding   (b) Lack of Adventure

(c) Lack of Experience   (d) Lack of Imagination

53.   The meaning of the word 'Scorn' in the text is:

(a) Reject   (b) Accept

(c) Snub   (d) Legal

54.   One hates History subject as it is:

(a) Not taught properly   (b) Difficult to memorize the lessons

Page **40** of **43**

(c) Has volumeness books (d) Has tough language

55. What is the best title of the paragraph?

(a) Experience (b) Imagination

(c) Children (d) Skittle

56. The nth derivative of xe^x is:

(a) $(x + n) e^x$ (b) $nx\ e^x$

(c) $x^n\ e^x$ (d) $x\ e^{nx}$

57. The Taylor Series of $e^x \cos x$ is:

(a) $1 + x + \frac{x^3}{3} + \frac{x^4}{6} + \cdots$ (b) $1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \cdots$

(c) $1 + x - \frac{x^3}{3} - \frac{x^4}{6} + \cdots$ (d) $1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \cdots$

58. The Function $f(x) = \begin{cases} x, x\ is\ Rational \\ 0, x\ is\ Irrational \end{cases}$ is:

(a) Continuous at all points in R (b) Continuous nowhere

(c) Continuous only at x=0 (d) Continuous at all Rational x

59. If a differential function $f : [0, 5] \to \mathbb{R}$ vanishes at x = 0, 1, 2, 3, 4, 5 then the equation $f'(x) = 0$ has:

(a) Exactly one solution (b) No Solution

(c) Five or more solutions (d) Exactly Six Solutions

60. Which one of the following is countable?

(a) $\mathbb{R} \setminus \mathbb{Q}$ (b) $\mathbb{Q} \setminus \mathbb{Z}$

(c) $\mathbb{R} \setminus \mathbb{Z}$ (d) $\mathbb{R} \setminus \mathbb{N}$

61. Which one of the following is false in general?

(a) Monotonically increasing bounded sequence converges

(b) Monotonically decreasing bounded sequence converges

(c) Convergent monotone sequence is bounded

(d) Monotonically increasing sequence is bounded

62. Consider the sequence of function $f_n : [0, 1) \to \mathbb{R}$ definded by $f_n(x) = \frac{1}{nx+1}$

(n = 1, 2, 3, …)

(a) < f_n > does not converge

(b) < f_n > converges but not uniformly

(c) $< f_n >$ converges uniformly

(d) $< f_n >$ converges monotonically and uniformly

63. The Radius of convergence of the series $\sum_{n=0}^{\infty} \frac{x^n}{2^{n+1}}$ is:

(1) 0   (2)   1

(3) 2   (4) ∞

64. The series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$

(a) log2   (b)   -log2

(c) 0   (d) $\frac{\pi}{2}$

65. The set of natural numbers $\mathbb{N} = \{1, 2, 3, \ldots\}$

(a) Is not closed under addition

(b) Has no identity element for multiplication

(c) Is commutative under both addition and multiplication

(d) Is a group under multiplication

66. The identity element in the group of positive rational numbers under the binary operation $a * b = \frac{ab}{2}$ is:

(a) 0   (b)   1

(c) 2   (d) $\sqrt{2}$

67. Lagrange theorem is the following statement about a finite group G:

(a) Order of an element divides order of G

(b) Order of any subgroup divided order of G

(c) Sum of orders of elements in G the order of G

(d) Order of G equals order of identity element

68. If H_1, H_2 are subgroups of a group G, then:

(a) $H_1 \cup H_2$ is a subgroup of G   (b) $H_1 \cap H_2$ is a subgroup of G

(c) $H_1 \setminus H_2$ is a subgroup of G   (d) $H_1 H_2$ is a subgroup of G

69. Let H be a subgroup of a group G. then G/H is defined except possibly when:

(a) G is Abelian   (b)   G is cyclic

(c) G is a group of Prime order   (d)   G is Non-Abelian.

70. Which one of the following is not a ring with respect to usual addition and multiplication?

(a) The set of even integers

(b) The set of integers which are multiple of 3

(c) The set of positive integers

(d) The set of integers