

UNIVERSITY OF DELHI  
DEPARTMENT OF COMPUTER SCIENCE

**MCA/M.Sc. (Computer Science) Admissions 2013-2014**

**Important Dates and Timings**

<p><b>M.Sc. Computer Science</b></p> <p>Application Form &amp; Information Bulletin</p> <p>Application form and receipt of completed application forms with draft (Separate application for MCA and M.Sc. Computer Science courses is required)</p> <p>Reporting Time for Entrance Test (Part-I)</p> <p>Time for Entrance Test (Part-I)</p> <p>Reporting Time for Entrance Test (Part-II)</p> <p>Time for Entrance Test (Part-II)</p> <p>Submission of result of qualifying examination (Bachelor's level)</p> <p>1<sup>st</sup> Admission List (Tentative)</p> <p>2<sup>nd</sup> Admission List (Tentative)</p>	<p>Available w.e.f. 1<sup>st</sup> June 2013 at websites: <a href="http://cs.du.ac.in">http://cs.du.ac.in</a> <a href="http://www.du.ac.in">http://www.du.ac.in</a></p> <p><b>3<sup>rd</sup> June 2013 to 28<sup>th</sup> June 2013</b></p> <p>06<sup>th</sup> July 2013 at 9.00 A.M.</p> <p>06<sup>th</sup> July 2013 at 9.30 A.M. to 12.30 P.M.</p> <p>06<sup>th</sup> July 2013 at 1.00 P.M.</p> <p>06<sup>th</sup> July 2013 at 1.30 P.M. to 4.30 P.M.</p> <p>19<sup>th</sup> July 2013</p> <p>23<sup>rd</sup> July 2013</p> <p>26<sup>th</sup> July 2013</p>
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UNIVERSITY OF DELHI  
DEPARTMENT OF COMPUTER SCIENCE

BULLETIN OF INFORMATION  
2013 - 2014

M.Sc. (COMPUTER SCIENCE)  
MCA (MASTER OF COMPUTER APPLICATIONS)

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HEAD OF THE DEPARTMENT

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| 5. | <u><a href="#">DR. NEELIMA GUPTA</a></u>       | ASSOCIATE PROFESSOR |
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| 1. MR. RAM RAI SINGH BEDI | OFFICE IN-CHARGE |
| 2. MR. RAJBIR GIRI        | OFFICE ATTENDANT |

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## 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 MCA courses in India. The department is proud of its more than 700 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.)**

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.

### **Under-graduate Programmes**

The Department also monitors/coordinates all under-graduate courses offered by constituent colleges of University of Delhi.

**2. Important Dates and Timings :** Candidates are advised to note the date & timing mentioned in the tables given below:

Table -1

<p><b>M.Sc. Computer Science</b></p> <p>Application Form &amp; Information Bulletin</p> <p>Application form and receipt of completed application forms with draft (Separate application for MCA and M.Sc. Computer Science courses is required)</p> <p>Reporting Time for Entrance Test (Part-I)</p> <p>Time for Entrance Test (Part-I)</p> <p>Reporting Time for Entrance Test (Part-II)</p> <p>Time for Entrance Test (Part-II)</p> <p>Submission of result of qualifying examination (Bachelor's level)</p> <p>1<sup>st</sup> Admission List (Tentative)</p> <p>2<sup>nd</sup> Admission List (Tentative)</p>	<p>Available w.e.f. 1<sup>st</sup> June 2013 at websites:  <a href="http://cs.du.ac.in">http://cs.du.ac.in</a>  <a href="http://www.du.ac.in">http://www.du.ac.in</a></p> <p><b>3<sup>rd</sup> June 2013 to 28<sup>th</sup> June 2013</b></p> <p>06<sup>th</sup> July 2013 at 9.00 A.M.</p> <p>06<sup>th</sup> July 2013 at 9.30 A.M. to 12.30 P.M.</p> <p>06<sup>th</sup> July 2013 at 1.00 P.M.</p> <p>06<sup>th</sup> July 2013 at 1.30 P.M. to 4.30 P.M.</p> <p>19<sup>th</sup> July 2013</p> <p>23<sup>rd</sup> July 2013</p> <p>26<sup>th</sup> July 2013</p>
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<p><b>Master of Computer Applications (MCA)</b></p> <p>Application Form &amp; Information Bulletin</p> <p>Application forms and receipt of completed application forms with draft (Separate application for MCA and M.Sc. Computer Science courses is required)</p> <p>Reporting Time for Entrance Test</p> <p>Time for Entrance Test</p> <p>Interview Schedule (Tentative)</p> <p>Submission of result of qualifying examination (Bachelor's level)</p> <p>1<sup>st</sup> Admission List (Tentative)</p> <p>2<sup>nd</sup> Admission List (Tentative)</p>	<p>Available w.e.f. 1<sup>st</sup> June 2013 at websites:  <a href="http://cs.du.ac.in">http://cs.du.ac.in</a>  <a href="http://www.du.ac.in">http://www.du.ac.in</a></p> <p><b>3<sup>rd</sup> June 2013 to 28<sup>th</sup> June 2013</b></p> <p>07<sup>th</sup> July 2013 at 9.00 A.M.</p> <p>07<sup>th</sup> July 2013 at 9.30 A.M. to 12.30 P.M.</p> <p>17<sup>th</sup> – 19<sup>th</sup> July 2013</p> <p>19<sup>th</sup> July 2013</p> <p>23<sup>rd</sup> July 2013</p> <p>26<sup>th</sup> July 2013</p>
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**Note:**

- (1) All information related to admission, including Entrance Test results and Admission list shall be notified on the websites <http://cs.du.ac.in>, <http://www.du.ac.in>
- (2) The Entrance Test will be conducted at University of Delhi only.

**3. Eligibility conditions****(a) Master of Computer Applications (MCA)****Examination Passed**

Any bachelor degree from the 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.

**(b) M.Sc. (Computer Science)****Examination Passed**

- i. B.Sc. (Honours) Computer Science (10+2+3 scheme) from University of Delhi or any other University whose examination is recognized as equivalent to University of Delhi.

**Minimum Percentage Required:**

60% marks in aggregate

- ii. B.Sc. Applied Physical Sciences with Mathematics and Computer Science/B.Sc.(General) Mathematical Sciences, (10+2+3 scheme) with Mathematics and Computer Science from University of Delhi.

**Minimum Percentage Required:**

60% marks in the aggregate with 60% marks in Computer Science and Mathematics separately.

- iii. 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.

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.

**4. Relaxations/ Concessions****(a) Scheduled Caste/ Scheduled Tribe<sup>1</sup>**

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 concerned 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.

<sup>1</sup> Ref: AC Resolution No. 88 dated/14/06/1983; EC Resolution No. 157 dated 24/12/2001.

**(b) Other Backward Classes<sup>2</sup>**

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% less 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% less 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.

**(c) 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%.

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

A concession of 5% marks in the minimum eligibility requirements in the qualifying examinations.

**(e) Concession in Application Fee**

The candidates belonging to the Scheduled Caste, Scheduled Tribes, and Persons with different ability shall be charged the admission form/entrance examination fee at concessional rates.

**5. Reservations****(a) 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% of total intake in each course
Schedule Tribe	= 7 ½ % of total intake in each course
Other Backward Classes	= 27% of total intake in each course

The seats reserved for the SC/ST shall be filled by the SC/ST candidates only. However,

<sup>2</sup> Ref: Notification No. Aca./2013-13/OBC/588 dated 11/04/2013.

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.

**(b) Supernumerary Seats**

**(i) Persons with Different Ability (PWD)**

3% 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).

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

5% 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:

- I. Widows/Wards of Defence personnel killed in action;
- II. Wards of serving personnel and ex-servicemen disabled in action;
- III. Widows/Wards of Defence personnel who died in peace time with death attributable to military service;
- IV. Wards of Defence personnel disabled in peace time with disability attributable to the military service; and
- V. 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
- 1<sup>st</sup> Class Stipendiary Magistrate
- Ministry of Home Affairs (for Police personnel in receipt of Gallantry Awards)

- (iii) **Foreign Nationals** = 5% 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.

- (iv) **Sports/ECA Persons** = up to 5% of total intake in each course.

Admission under these categories shall be made in accordance with the guidelines issued by the University from time to time.

**(c) Merit List**

The merit list for the general category seats will comprise of all the candidates in the order of merit. No one will be excluded from the same. In other words, it will also include SC/ST/OBC candidates if they come in the general merit. A candidate cannot be excluded from the general category merit list just because he belongs to SC/ST/OBC. Such a candidate is entitled to be considered under the General Category, as well as under the reserved category. Admission to open category seats will be strictly in the order of merit without excluding SC/ST/OBC candidates.

**(d) Certificate Requirement**

The colleges/Departments shall get the relevant certificates submitted for availing the benefit of reservation verified from the issuing authorities.

**6. 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:

- (a) **SC/ST/OBC Certificate:** For admission to a seat reserved for 'Scheduled Caste/ Scheduled Tribes /Other Backward Classes, attested copy of certificate should be submitted from an approved district authority stating the Scheduled Caste / Schedule Tribe /OBC to which the candidate belongs. A list of approved authorities is given below:
- (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).
- (b) Entitlement Card/Certificate: The candidates under CW category will be required to provide attested photocopy of Entitlement Card/ Certificate from the competent authority
- (c) 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 (a), (b) and (c) would be required to be produced for verification at the time of admission.

## **7. 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.

## 8. Application Fee

MCA/M.Sc. (Computer Science)      Rs.800/- for General/OBC Category

Rs.400/- for SC/ST/PH Category

Mode of Payment

Payment should be made by crossed Bank Draft in favour of **“Registrar, University of Delhi”** payable at New Delhi.

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

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

In case of non-receipt of the Admission Ticket for any reason, a request may be made to the department with two copies of photograph alongwith proof of having sent the application, not earlier than three days prior to the date of the Entrance Test 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.

## 10. 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.

## 11. Admission of Foreign Nationals

Foreign students seeking admission in the department and satisfying the eligibility criteria as mentioned in 3 are required to apply through the Deputy Dean (Foreign Students), Foreign Students Registry (FSR), c/o Room No. 11, First Floor Conference Center University of Delhi, Delhi - 110 007 (India). However, those foreign students who have passed the Bachelor's Degree examination (or are appearing for the same) from an Indian University would be required to appear for the Entrance 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 for admission, 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.

Foreign students are advised to submit TOEFL/IELTS score.

## 12. Admission Procedure

### Master of Computer Applications (MCA)

Admission to MCA course is based on Entrance Test and Interview. For preparing the final merit list, 80% weightage will be given to the score in the Entrance test and 20% weightage will be given to the score of the Interview.

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

1. Mathematical Ability
2. Computer Science
3. Logical Reasoning and English Comprehension.

#### Syllabus:

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, 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. Reading comprehension and correct usage of English language

### M.Sc. (Computer Science)

- i. 50% of the seats are filled on the basis of current academic year merit in the B.Sc.(H) Computer Science Examination of the University of Delhi. Students with gap year will not be considered. Only those students who have filled the Application form will be considered under this category.
- 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:

Part I : Objective type questions.

Part II: Comprehensive questions.

Students with 40% marks in Part I will qualify for Part II. A relaxation of 5% will be provided to the candidates belonging to SC/ST category.

For preparing the final merit list 60% weightage will be given to the score in the admission test (**Part II**) and 40% weightage will be given to the score of the qualifying examination (i.e. Bachelors level). The last date for submission of final year result for the purpose of merit list preparation will be specified in the bulletin of information.



In the event of any short fall of admission **through Entrance Test the remaining seats will be filled from the merit list of the candidates seeking admission through direct quota reserved for B.Sc. (Honours) Computer Science students of the University of Delhi and vice versa.** If a candidate is shortlisted in both the categories, he/she will be admitted through the merit. This decision will be taken at the time of admission only, and future withdrawals will not change the category of a candidate already admitted.

**13. Program Structure**

Details of program structure are available from the Department.

**14. Program Fee for MCA/M.Sc. (Computer Science)**

A program fee (course fee) of Rs.7,000/- per semester shall be charged over and above the normal University fee.

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

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

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

As per University rules.

## 17. Hostel Accommodation

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

*For men:*

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

*For women:*

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

## 18. Library

The University has a rich and up-to-date collection of books for use by the students and the faculty members.

## 19. Computing Facilities

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

## 20. Placement Cell

The department has a Placement Cell 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.

## 21. Important Points

- (i) Rounding off fractions of a mark is not permissible for determining the eligibility requirement of a candidate.
- (ii) All admissions made to the MCA / M.Sc. (Computer Science) course will be provisional subject to verification of their eligibility by the Mathematical Sciences Course Admission Committee and confirmation by the University.
- (iii) Disputes, if any, arising out of or relating to any matter whatsoever, concerning the process of admission shall be subject to the exclusive jurisdiction of the competent court only in Delhi.
- (iv) There is no direct admission to the second or third year of the MCA /Second Year of M.Sc. (Computer Science) course.

## 22. Instructions for Entrance Test for MCA/M.Sc. (Computer Science)

- (i) All candidates will take their seat as per time schedule mentioned in item No.2 on Page No.2 ( Important Dates & Timing) 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 test booklet.
- (iii) 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. 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 Optical Marks Scanner.

- (iv) Late Entry: The entry in the Examination Hall will not be allowed after the start of the test i.e. 9.30 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.
- (v) Pens/Ball Pens/Pencil Erasers: The candidates are required to bring their own ink/ball point pens, HB pencils (any other pencil HH, HHH, etc., should not be used). In case any pencil other than HB pencil is used, the answer sheet may be rejected by the Optical Mark Scanner.
- (vi) Answer Sheet and Checking of Serial Number: The 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.
- (vii) Rough Work: All rough work is to be done in the space provided in test booklet only. Rough work MUST NOT be done in the 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.
- (viii) Test booklet should be unsealed by the Candidate only after the announcement by the Invigilator.
- (ix) The OMR-Answer Sheet will be collected from the candidate after the Test is over.
- (x) The answers are to be given in the first one hundred slots of the OMR-answer-sheet only and NOT in the Test Booklet.
- (xi) Do not start writing answers until you are asked to do so. Mark the answer immediately on solving the question.
- (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 take the question booklet before the examination is over.

- (xvi) Eatables/smoking are not allowed in the Examination Hall/Room.
- (xvii) Sample Questions supplied to candidates only indicate the type of questions that may be asked and do not cover the entire syllabus. The degree of difficulty of questions in the Entrance Test may also vary.
- (xviii) Don't bring your Mobile Phones in the Examination Hall.

### 23. Specimen Answer Sheet

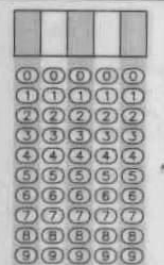

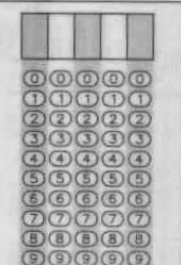
**उत्तर पत्र ANSWER SHEET (ORS)**

पृष्ठ 1  
SIDE 1

SERIAL NUMBER

<b>55656</b>	1. पूरा नाम (अंग्रेजी के बड़े अक्षरों में) / FULL NAME (IN CAPITALS)		
2. परीक्षार्थी क्रमांक / ROLL NO.	3. परीक्षा-केंद्र / CENTRE OF EXAM.	4. वर्ग / CATEGORY	5. मालिका / SERIES
6. प्रश्नपुस्तिका अनुक्रमांक / TEST BOOKLET SERIAL NO.		7. परीक्षा दिनांक / DATE OF EXAM.	

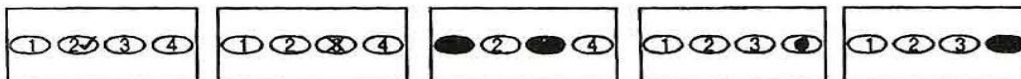
पृष्ठ  
SIDE 2

	10. परीक्षार्थी क्रमांक ROLL NO.	11. वर्ग CATEGORY	12. मालिका SERIES	13. प्रश्नपुस्तिका अनुक्रमांक TEST BOOKLET SERIAL NO.
8. परीक्षार्थी के हस्ताक्षर (बॉल-पाइंट पेन से) CANDIDATE'S SIGNATURE (IN BALL-POINT PEN)		SC <input type="checkbox"/> ST <input type="checkbox"/> GEN <input type="checkbox"/> FS <input type="checkbox"/> CW <input type="checkbox"/> PH <input type="checkbox"/> OBC <input type="checkbox"/>		
9. पर्यवेक्षक के हस्ताक्षर (बॉल-पाइंट पेन से) INVIGILATOR'S SIGNATURE (IN BALL-POINT PEN)				

## 24. Instructions for Marking Answers in the Answer Sheet

- Use first hundred slots in OMR answer sheet.
- Use HB Pencil only.
- Completely fill the oval so that the number inside the oval is not visible.
- 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



- If you wish to change an answer, first ERASE completely the already darkened oval, and then make a fresh mark.
- Make marks only in the space provided. Please do not make any stray mark on the answer sheet.
- Mark your answer only in the appropriate space against the serial number corresponding to the question you are answering.

## 25. Conduct Rules for Entrance Test for MCA/M.Sc. (Computer Science)

- 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.
- A seat with the roll number will be allotted to each candidate. Candidates must occupy their allotted seats.
- No candidate, without the special permission of the Superintendent or the Invigilator concerned, is allowed to leave his/her seat or the Examination Hall until he/she finishes his/her examination. The candidates should not leave the Examination Hall without handing over their Test Booklets and the Answer Sheets to the Invigilator on duty.
- 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, notes mobile phone, calculation device etc., should be kept outside the Examination Hall.
- The candidates may 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.
- Tea, Coffee, Cold Drink, Snacks and smoking etc. are not allowed to be taken inside the Examination Hall during examination hours.
- The candidates must keep perfect silence during the examination and must not indulge in any conversation or gesticulation.

- (h) Use of any calculating device like, log tables, calculator is not allowed.
- (i) The candidates must not bring mobile phones, pagers or any other electronic device to the Examination Hall.
- (j) The candidates must submit the answer sheet to the invigilator after the test is over. The case of the defaulter will be reported to the police and the result of such candidates will be withheld.
- (k) No clarification regarding any discrepancy in the question paper will be entertained while the examination is in progress. However, a representation either to the Superintendent of the Centre/ Controller of Examinations can be made by the candidate immediately after the examination.
- (l) 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.

## 26. 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, Euler'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 Weierstrass 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 Practitioner's Approach McGraw Hill.
- A. Silberschatz, P.B. and Greg Gargne, Galvin. Operating System Concepts, John Wiley.
- A. S. Tanenbaun, Computer Networks, Pearson Education/Prentice Hill of India.
- J. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, Prentice Hall of India.
- M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C++, John Wiley & Sons.

- 27. Jurisdiction of Statutory Authorities:** Information contained in this bulletin is subject to any subsequent directives of the statutory authorities.

## 28. Sample Questions

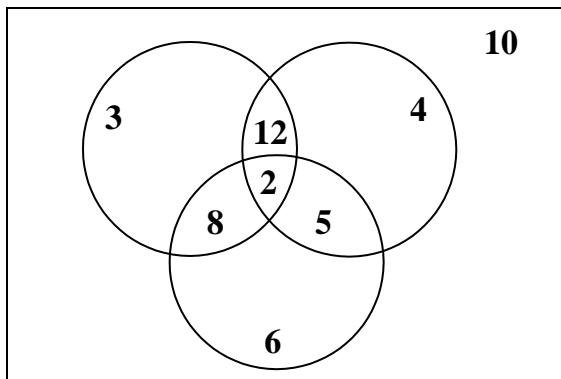
### Master of Computer Applications (MCA)

1. The points  $1 + i$ ,  $1 - i$ ,  $-1$ ,  $-i$  are
  - (1) Collinear.
  - (2) Within a circle of radius 1.
  - (3) Vertices of an equilateral triangle.
  - (4) none of the above.
  
2. The asymptotes of the curve –  
 $(y - x)(y - 2x)^2 + (y + 3x)(y - 2x) + 2x + 2y - 1 = 0$  are
  - (1)  $y = x + 4$ ,  $y = 2x - 2$ ,  $y = 2x - 3$
  - (2)  $y = x$ ,  $y = x + 1$ ,  $y = x/2$
  - (3)  $y = -3x$ ,  $y = x$ ,  $y = x/2$
  - (4)  $y = x - 4$ ,  $y = 2x + 2$ ,  $y = 2x + 3$
  
3. If  $Q$  denotes the field of rational numbers and  $C$  denotes the field of complex numbers then  $C$  as a vector space over  $Q$  has dimension
  - (1) 2
  - (2) even
  - (3) odd
  - (4) infinity
  
4. If every cross-section of a bounded surface in three dimensions is a circle then surface
  - (1) must be a sphere
  - (2) must be a cylinder
  - (3) must be a cone
  - (4) must be a third-degree surface
  
5. Trace of a square matrix is the sum of its diagonal elements. Suppose  $A$  is a matrix with complex entries. Let  $A'$  represent the transpose of  $A$ . Then
  - (1)  $A = 0$  if  $\text{trace}(A^T A) = 0$
  - (2)  $A = 0$  if  $A$  has real entries and  $\text{trace}(A^T A) = 0$
  - (3)  $A = 0$  if  $\text{trace}(A^2) = 0$
  - (4)  $\text{Trace}(A^2)$  has non-negative real part.

6. If a statistic  $t$  has Student's distribution with 1 d.f. then the distribution of  $t^2$  is
- (1)  $\beta_2(1,1)$
  - (2)  $\chi^2$  with 1 d.f.
  - (3) F with (1,1) d.f
  - (4) none of the above
7. The terms of two divergent series  $\sum a_n, \sum b_n$  decrease to zero. Then the series  $\sum \min(a_n, b_n)$
- (1) diverges
  - (2) may converge
  - (3) always oscillates
  - (4) none of the above
8. Two random variables  $X$  and  $Y$  are such that  $Y = X^2$ . Then the correlation coefficient between  $X$  and  $Y$
- (1) is 1
  - (2) is positive
  - (3) is zero
  - (4) need not exist.
9. A function  $f(x)$  defined in an interval  $[a, b]$  attains a maximum value at  $x = b$ . Then
- (1)  $f(b) = 0$
  - (2)  $f(b)$  need not exist.
  - (3)  $f(x)$  is monotonically increasing in  $[a, b]$ .
  - (4)  $f(b) < 0$ .
10. Let  $f(x) = |x|, x \in [-1, 1]$ . Consider the following statements: (i)  $f(x)$  is continuous everywhere, (ii)  $f(x)$  is differentiable everywhere. (iii)  $f(x)$  is not differentiable at  $x = 0$ . Then
- (1) All the statements are false.
  - (2) Only (iii) is false.
  - (3) Only (iii) is true.
  - (4) Only (ii) is false.

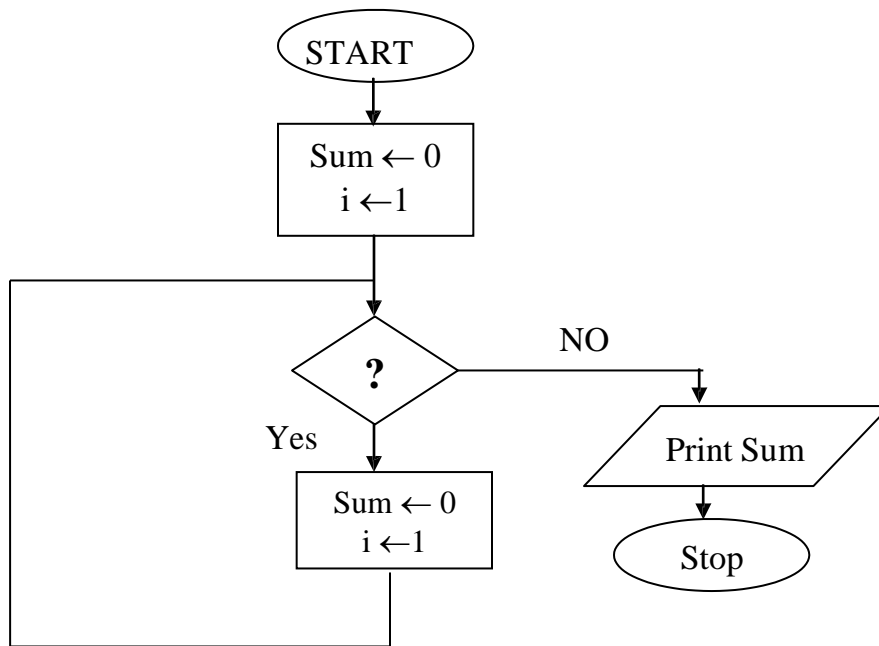
11. If  $\vec{a}$  and  $\vec{b}$  are unit vectors such that the length  $(\vec{a} + \vec{b})$  is  $\sqrt{2}$  then angle between  $\vec{a}$  and  $\vec{b}$  is
- (1)  $90^\circ$
  - (2)  $60^\circ$
  - (3)  $45^\circ$
  - (4)  $30^\circ$
12. The order and degree of the differential equation  $[1 - (dy/dx)^2]^{3/2} = \left(\frac{d^2y}{dx^2}\right)^{2/3}$  are respectively
- (1) 2 and 4
  - (2) 2 and 9
  - (3) 1 and 18
  - (4) 2 and 18
13. The sequence  $\langle a_n \rangle$  defined by  $a_n = 2 + (-1)^n/n$
- (1) is convergent and converges to 2
  - (2) is not convergent
  - (3) oscillates between 0 and 2
  - (4) oscillates infinitely
14. Find the value of K for which the equation,  $x^3 + 3x + K = 0$  has two distinct roots in  $[0, 1]$ .
- (1) 0
  - (2) 1
  - (3)  $1/2$
  - (4) None

15. Consider the following Venn Diagram :



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

- (1) 2500
  - (2) 2700
  - (3) 3000
  - (4) 106
16. The flowchart shown below describes an algorithm to evaluate the sum of first 100 odd numbers.



The correct condition in place of? In the diamond box should be

- (1)  $i < 100$   
 (2)  $i < 101$   
 (3)  $i < 199$   
 (4) None of the above
17. A gambler played the following game with a friend. He bet half the money in his pocket on the toss of a coin; he won on heads and lost on tails. The coin was tossed and the money held by the gambler. At the end, the number of times the gambler lost was equal to the number of times he won. Then:
- (1) he gained  
 (2) he lost  
 (3) he broke even  
 (4) all these are possible
18. The number of zeroes in the binary representation of  $8^5 + 8^3 + 5 \cdot 8^2 + 7 \cdot 8 + 7$  is:
- (1) 7  
 (2) 8  
 (3) 9  
 (4) none of the above.
19. Consider the following truth table :
- | $p$ | $q$ | $f(p,q)$ |
|-----|-----|----------|
| T   | T   | T        |
| T   | F   | T        |
| F   | T   | F        |
| F   | F   | F        |
- Then  $f(p,q)$  can be written as
- (1)  $p$  and  $q$   
 (2)  $p$  or  $q$   
 (3)  $p$   
 (4)  $q$
20. A, B, C, D, are four persons with pairwise distinct wealth such that at least one of  $\{A, B\}$  is richer than at least one of  $\{C, D\}$ , at least one of  $\{A, D\}$  is richer than at least one of  $\{B, C\}$ . Then :

- (1) A is the richest
  - (2) B is not the richest
  - (3) A is not the poorest
  - (4) none of the above.
21. Consider the following five statements of which exactly one is false :
- (1) A is taller than B.
  - (2) B is taller than D.
  - (3) C is taller than D.
  - (4) B is taller than C.
  - (5) A is taller than C.
- Then
- (1) the false statement is (4)
  - (2) the false statement is (1)
  - (3) the false statement is (5)
  - (4) the false statement is (2)

*For questions 22 and 23*

Given below are the data of the examination result:

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

22. How many candidates passed in Geography, but failed in one or more subjects?
- (1) 1200
  - (2) 1820
  - (3) 2230
  - (4) 3670.

23. How many candidates failed because of having failed in two or more subjects?
- (1) 790
  - (2) 1820
  - (3) 2230
  - (4) 3670

Read the following paragraph and answer the question that follow:

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

24. The number of Asian Rhinos is going down because,
- (1) They are being killed by amateur hunters
  - (2) They are not well-protected in sanctuaries
  - (3) They are being hunted down by poachers
  - (4) They are becoming extinct because their habitats are shrinking.
25. The National parks mentioned in the passage are
- (1) In India
  - (2) One each in India and Nepal
  - (3) One in India and two in Nepal
  - (4) Two in India and one in Nepal
26. The comparison shows that
- (1) The situation has improved in Nepal but worsened in India
  - (2) It has improved in India but worsened in Nepal
  - (3) It has worsened in both
  - (4) It has improved in both



27. Mark the statement that is NOT true

- (1) The river Brahmaputra flows by Kaziranga
- (2) The rhino's hide is believed to have medicinal properties
- (3) 'Establishment of democracy' refers to Nepal
- (4) More rhinos were killed by poachers in India in 2006 than in 2007

28. Question on C Language

```
int sum=0,
int c=l,j;
for (j=i;j<10,j++)
    sum=sum+j;
    printf(i% d , sum)
```

- (1) 55
- (2) 60
- (3) 65
- (4) 70

**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  $x \in \mathbb{R} \sim \{0\}$ ,
  - (2) The set  $G = \{\text{functions } f_c: \mathbb{R} \rightarrow \mathbb{R}, f_c(x) = -x + c, c \in \mathbb{R}\}$
  - (3) The set  $G$  of all functions from a set  $A$  consisting of four elements to itself.
  - (4) The set  $G = \{\text{functions } f_c: \mathbb{R} \rightarrow \mathbb{R} : f_c(x) = cx, c \in \mathbb{R} \sim \{0\}\}$
2. Which of the following statements is not true?
  - (1) If  $U$  is a ring with unity in which each non-zero element is a unit, then each non-zero element of each quotient ring of  $R$  is also a unit,
  - (2) If  $U$  is right ideal and  $V$  is a left ideal of a ring  $R$ , then  $U \cap V$  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.

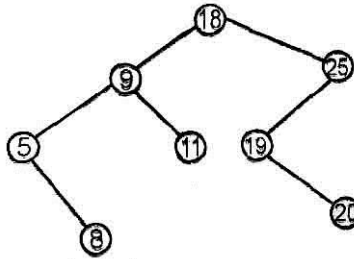
3. Let  $V$  be the vector space of all  $4 \times 4$  matrices over  $\mathbb{R}$ . Then, which of the following fails to be a subspace of  $V$ ?
- (1) The set of all upper triangular matrices in  $V$ .
  - (2) The set of all symmetric matrices in  $V$ .
  - (3) The set of all diagonal matrices in  $V$ .
  - (4) The set of all singular matrices in  $V$ .
4. The six roots of the equation  $(2+z)^6 + (2-z)^6 = 0$  are
- (1)  $\pm i \tan \pi/6, \pm 2i \tan \pi/12, \pm i$
  - (2)  $\pm 2i \tan \pi/12, \pm 2i \tan 5\pi/12, \pm 2i$
  - (3)  $\pm i \tan \pi/12, \pm 3i \tan \pi/24, \pm i$
  - (4)  $\pm i \tan \pi/24, \pm 3i \tan \pi/12, \pm 2i$
5. Which of the following is false?
- (1) It  $(1+\cos x)^{\sec x} = e^3$   
 $x \rightarrow \pi/2$
  - (2) It  $e^{1/x} / (1+e^{1/x}) = 0$   
 $x \rightarrow \pi/2$
  - (3) The function  $f(x) = \frac{(x-1)}{(1/e^{1/(x-1)})}$  :  $x \neq 1$   
0 :  $x \neq 0$   
is continuous at  $x = 1$ .
  - (4) For two functions  $f$  and  $g$ , if the product  $fg$  is continuous at a point, then  $f$  and  $g$  may or may not be continuous at that point.
6. For the curve  $x^2 y^2 = (a+y)^2 (b^2 - y^2)$
- (1)  $(0, -a)$  is a node, a cusp or a conjugate point according as  $b > a$ ,  $b = a$  or  $b < a$  respectively.
  - (2)  $(0, -a)$  is a cusp, a node or a conjugate point according as  $b > a$ ,  $b = a$  or  $b < a$  respectively.
  - (3)  $(0, -a)$  is a node, conjugate point or a cusp according as  $b > a$ ,  $b = a$  or  $b < a$  respectively.
  - (4)  $(0, -a)$  is a conjugate point, a cusp, or a node according as  $b > a$ ,  $b = a$ , or  $b < a$ .

7.  $\int_0^{x/2} (\sin 3\theta \sin 5\theta) / \sin \theta \, d\theta$  is equal to
- (1) 71/105
  - (2) 72/105
  - (3) 73/105
  - (4) 74/105
8. Find the volume of the solid bounded by the paraboloid  $x = x^2 + y^2$ , cylinder  $y = x^2$  and the planes  $y=1, z=0$
- (1) 85/105
  - (2) 86/106
  - (3) 87/105
  - (4) 88/105
9. If  $|f(x) - f(y)| < (x-y)^2$ , for all real numbers  $x$  and  $y$  and  $f$  is differentiable over  $[a, b]$ , then
- (1)  $f$  is strictly monotonically increasing function over  $[a, b]$
  - (2)  $f$  is strictly monotonically decreasing function over  $[a, b]$
  - (3)  $f$  is a constant function over  $[a, b]$
  - (4) Nothing can be concluded about the function  $f$ .
10. If on an average, 1 vessel in every 10 is wrecked, then the probability that out of 5 vessels expected to arrive, at least 4 will arrive safely is
- (1) 0.91854
  - (2) 0.3216
  - (3) 0.0012
  - (4) 0.6384
11. If  $F = (y^2 + z^3, 2xy - 5z, 3xz^2 - 5y)$ , then a scalar function  $\phi(x, y, z)$  such that  $F = \text{grad. } \phi$  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

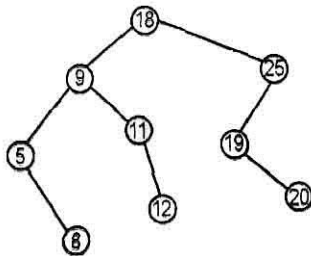
- (1)  $2i - 1$
- (2)  $2^i$
- (3)  $2i - 1$
- (4)  $2^{i-1} - 1$

13. Consider the following Binary Search Tree

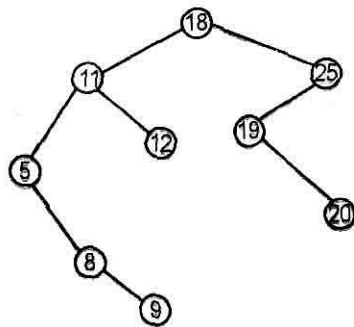


The tree that results after inserting 12 is

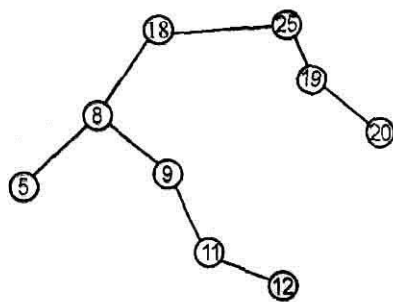
(1)



(2)



(3)



(4) None of these

14. Which of the following is true?

- (1)  $(n+b)^a = O(n^b)$
- (2)  $(n+b)^a = O(n^a)$
- (3)  $(n+b)^a = O(a^n)$
- (4)  $(n+b)^a = O(b^n)$

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

- (1)  $|V|$  edges
- (2)  $|V| - 1$  edges
- (3)  $(|V| - 1)/2$  edges
- (4) None of the above

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

- (1) Quick sort
- (2) Merge sort
- (3) Insertion sort
- (4) Heap sort

17. Consider the following algorithm

```

for i ← 1 to n-1
    for j ← i + 1 to n
        print(i, j)
  
```

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

- (1)  $2n$
- (2)  $\frac{n(n-1)}{2}$
- (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)  $n^k = \theta(n^{k+1})$
- (3)  $n^{k+1} = O(n^k)$
- (4) None of these
19. For any given graph G, the worst case complexity of DFS is
- (1) more than that of BFS
- (2) same as that of BFS
- (3) less than that of BFS
- (4)  $O(|E|)$  where  $|E|$  is the number of edges in G.
20. The process to process delivery of the entire message is the responsibility of the
- (1) network layer
- (2) transport layer
- (3) physical layer
- (4) application layer
21. Which logic does the following table represent
- | A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |
- (1) AND
- (2) OR
- (3) XOR
- (4) None of the above

22. Which of the following application would fall in the category of real-time applications?
- (1) pay-roll application
  - (2) airline- reservation application
  - (3) video-conferencing application
  - (4) process-control applications of chemical plant
23. Let R (A3) be a relational scheme, then R is necessarily in
- (1) first normal form only
  - (2) first, and second normal forms only
  - (3) first, second and third normal forms only
  - (4) first, second, third normal forms as well as BCNF
24. Key process areas of CMM level 4 are also satisfied by a process which is
- (1) CMM level 2
  - (2) CMM level 3
  - (3) CMM level 5
  - (4) All of the above.
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.
26. Read the following paragraph and answer the questions that follow:

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

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

27. The number of Asian Rhinos is going down because,
- (1) They are being killed by amateur hunters
  - (2) They are not well-protected in sanctuaries
  - (3) They are being hunted down by poachers
  - (4) They are becoming extinct because their habitats are shrinking.
28. The National parks mentioned in the passage are
- (1) In India
  - (2) One each in India and Nepal
  - (3) One in India and two in Nepal
  - (4) Two in India and one in Nepal
29. The comparison shows that
- (1) The situation has improved in Nepal but worsened in India
  - (2) It has improved in India but worsened in Nepal
  - (3) It has worsened in both
  - (4) It has improved in both
30. Mark the statement that is NOT true
- (1) The river Brahmaputra flows by Kaziranga
  - (2) The rhino's hide is believed to have medicinal properties
  - (3) 'Establishment of democracy' refers to Nepal
  - (4) More rhinos were killed by poachers in India in 2006 than in 2007

## Part II

1. Show first three iterations of the insertion sort algorithm for arranging the data in ascending order:  
16, 7, 5, 4, 20, 36.
2. Give a recursive algorithm to compute the height of a binary tree.
3. Differentiate between method overloading & method overriding.
4. Prove that the sum of the series  $\cos \theta \sin \theta + \cos^2 \theta \sin^2 \theta + \cos^3 \theta \sin^3 \theta + \dots$  to  $n$  terms, ( $q \neq k \pi$ ) is  $\cot \theta (1 - \cos^n \theta \cos n \theta)$ .
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.

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

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

*(i) Why is the number of Asian Rhinos is going down?*

*(ii) In what sense does the National Park in Nepal present an intriguing scenario?*