

# **MASTER OF COMPUTER APPLICATIONS (MCA)**

MCA/ASSIGN/SEMESTER-V

**ASSIGNMENTS**

**(July - 2015 & January - 2016)**

**MCS-051, MCS-052, MCS-053, MCSL-054,**

**MCSE-003, MCSE-004, MCSE-011**



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES  
INDIRA GANDHI NATIONAL OPEN UNIVERSITY  
MAIDAN GARHI, NEW DELHI – 110 068**

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### Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to MCA Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the MCA Programme Guide.
4. The viva voce is compulsory for the assignments. For any course, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as not successfully completed and would be marked as ZERO.

|                                  |          |   |
|----------------------------------|----------|---|
| <b>Course Code</b>               | <b>:</b> | <b>MCS-051</b>  |
| <b>Course Title</b>              | <b>:</b> | <b>Advanced Internet Technologies</b>   |
| <b>Assignment Number</b>         | <b>:</b> | <b>MCA(V)/051/Assignment/15-16</b>  |
| <b>Maximum Marks</b>             | <b>:</b> | <b>100</b>  |
| <b>Weightage</b>                 | <b>:</b> | <b>25%</b>  |
| <b>Last Dates for Submission</b> | <b>:</b> | <b>15<sup>th</sup> October, 2015 (For July 2015 Session)</b><br><b>15<sup>th</sup> April, 2016 (For January 2016 Session)</b> |

**There are eight questions in this assignment. Rest 20 marks are for viva-voce. Answer all the questions. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.**

1. (a) Assume that there is a table named student in Oracle with fields (student id, student name, student phone, student address and data). Write a code and run the programme which will display all the fields of a student table with data in a tabular manner using servlet and JDBC. *(5 Marks)*  
(b) Write any five JSP tags and briefly explain. *(5 Marks)*
  
2. (a) Write a code to insert a record in a product table with fields: product-id, prod-name, quantity, price. Assume that the product table is in oracle. Use JSP and JDBC. *(6 Marks)*  
(b) Explain the advantages and disadvantages of two types of JDBC drivers. *(4 Marks)*
  
3. (a) Create a telephone enquiry system of any organization through which a customer could enquire extension number/telephone number of officials working in different departments. Use EJB. *(6 Marks)*  
(b) What criteria should a developer keep in mind while choosing between a session bean and an entity bean. *(4 Marks)*
  
4. (a) Implement the award list of MCA Ist and second year TEE(P) examination as an XML document. The table must have student enrolment number, name, study centre code and TEE(P) subjects and their scores. *(6 Marks)*  
(b) Define XML entity. Why XML is more suitable than HTML for use in the web. *(4 Marks)*
  
5. (a) What are the advantages of using an entity beans for database operations over directly using JDBC APIs to do database operations? When would I need to use one over the other? *(5 Marks)*  
(b) Differentiate between validating and non-validating XML-Parser. *(5 Marks)*

6. (a) Describe the use of SSL authentication in java clients with the help of a sample code. (6 Marks)
- (b) Describe the constituents of a digital certification. (4 Marks)
7. (a) What are the different recovery procedures in security implementation. (5 Marks)
- (b) Explain database handling in JSP using type 2 and type 4 drivers. (5 Marks)
8. (a) How do you invoke a Servlet? Draw different phases of Servlet life cycle. (5 Marks)
- (b) Explain the importance of deployment descriptor in Servlet. (5 Marks)

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|----------------------------------|---|---|
| <b>Course Code</b>               | : | <b>MCS-052</b>  |
| <b>Course Title</b>              | : | <b>Principles of Management and Information Systems</b>   |
| <b>Assignment Number</b>         | : | <b>MCA(V)/052/Assignment/15-16</b>  |
| <b>Maximum Marks</b>             | : | <b>100</b>  |
| <b>Weightage</b>                 | : | <b>25%</b>  |
| <b>Last Dates for Submission</b> | : | <b>15th October, 2015 (For July 2015 Session)<br/>15th April, 2016 (For January 2016 Session)</b> |

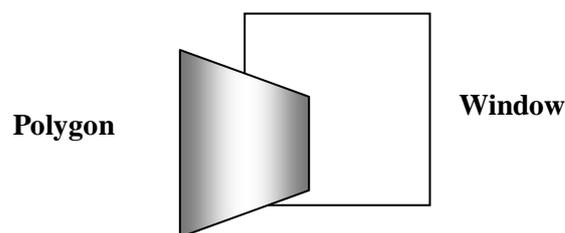
**This assignment has eight questions. Answer all questions. Each question is of 10 marks. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Answer to each part of the question should be confined to about 300 words.**

1. Differentiate between MIS and a computer system. Write characteristics of MIS. Also, discuss the common factors which are responsible for the failure of MIS. *(10 Marks)*
2. Write the advantages of implementing ERP. Discuss how it can be implemented in an organisation. Also, Compare it with CRM and SCM. *(10 Marks)*
3. List the different criteria which can be used in “decision making”. Explain how quality of information improves the knowledge and decision making capability of the people. *(10 Marks)*
4. Define the term “Business Intelligence”. Discuss the features of any two Business Intelligence tools. *(10 Marks)*
5. Explain how system analysis approach is different in new system requirement compared to the existing system. What problems does the system analyst face in ascertaining the information requirement at the various levels of Management? *(10 Marks)*
6. What is Decision Support System (DSS)? Explain different components of DSS with a diagram. How it does facilitate managers in decision making. *(10 Marks)*
7. Explain the similarities and differences between viruses and hackers. Discuss the importance of information security policies and information security plan. *(10 Marks)*
8. Explain the significance of Knowledge Management. Discuss the issues to be considered for successful implementation of knowledge management? *(10 Marks)*

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| <b>Course Code</b>               | : | <b>MCS-053</b>  |
| <b>Course Title</b>              | : | <b>Computer Graphics and Multimedia</b>   |
| <b>Assignment Number</b>         | : | <b>MCA(V)/053/Assignment/15-16</b>  |
| <b>Maximum Marks</b>             | : | <b>100</b>  |
| <b>Weightage</b>                 | : | <b>25%</b>  |
| <b>Last Dates for Submission</b> | : | <b>15<sup>th</sup> October, 2015 (For July 2015 Session)</b><br><b>15<sup>th</sup> April, 2016 (For January 2016 Session)</b> |

**There are four questions in this assignment. Answer all the questions. 20 Marks are for viva-voce. You may use illustrations and diagrams to enhance explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Not attending the viva leads to non evaluation of assignment**

1. (a) Differentiate between the following: *(5 Marks)*
  - (i) Painting and Drawing
  - (ii) Raster Scan and random Scan
  - (iii) Simulation and Animations
  - (iv) Visualisation and Image Processing
- (b) What are the advantages and disadvantages of using DDA algorithm for line generation? List the steps of the algorithm. Use this algorithm to draw a line with endpoints (2, 3) and (9, 8). *(5 Marks)*
- (c) What is line clipping? Explain the Cyrus Beck line clipping algorithm with the help of an example. *(5 Marks)*
- (d) Explain the Sutherland Hodgman polygon clipping algorithm. Using this algorithm clip the following polygon against the rectangular window as given below. Make suitable assumptions. *(5 Marks)*



2. (a) Explain the Homogeneous Coordinate System with the help of an example. Assume that a triangle ABC has the coordinates A(0, 0), B(5,8), C(4,2). Find the transformed coordinates when the triangle ABC is subjected to the clockwise rotation of  $45^\circ$  about the origin and then translation in the direction of vector (1, 0). You should represent the transformation using Homogeneous Coordinate System. *(5 Marks)*

- (b) A polygon has 4 vertices located at A (0, 0) B (3, 0), C (3, 3), D (0, 3). (5 Marks)

Apply the following transformations on the polygon:

- (i) Translate 2 units along x-axis and  
(ii) xy shear about the origin.

You must make and state suitable assumptions.

- (c) What is projection? What are the different types of projections? Explain the Oblique projection. Obtain the isometric view of a cuboid of the size  $8 \times 6 \times 4$ . (5 Marks)
- (d) Obtain the perspective transformation onto  $z = 2$  plane, where centre of projection is at (0,0,10). Also define the term vanishing point. (5 Marks)
3. (a) What are the uses of Bezier Curves in Computer Graphics? Draw a Bezier curve having the control points as  $p_0$  (0, 0),  $P_1$  (2, 5),  $P_2$  (5, 9),  $P_3$  (10, 20). Calculate the coordinates of the points on the curve corresponding to the parameter  $u = 0.2, 0.4, 0.6$ . Draw a rough sketch of the curve and show coordinates of various points on it? (5 Marks)
- (b) Why do you need to use visible-surface detection in Computer Graphics? Explain Scan Line method along with the algorithm for the visible-surface detection with the help of an example. How scan line method is different to z-buffer method? (5 Marks)
- (c) Explain the following terms in the context of computer Graphics using suitable diagram and /or mathematical equations or one example. (10 Marks)
- (i) Depth Buffer Method  
(ii) Area Subdivision Method  
(iii) Basic Ray Tracing Algorithm  
(iv) Diffuse Reflection  
(v) Equation of a plane that passes through point  $P(0,0,0)$  and the normal to plane is given by  $N (1,0,-1)$

4. Explain the following terms with suitable diagram / example (20 Marks)
- (i) Compression and decompression in digital video  
(ii) Hypermedia and hypertext  
(iii) Types of Bitmap and Vector graphics  
(iv) Ray tracing and Ray casting  
(v) gif and jpeg images

**Course Code** : **MCSL-054**  
**Course Title** : **Laboratory Course**  
**Assignment Number** : **MCA(V)/L-054/Assignment/15-16**  
**Maximum Marks** : **100**  
**Weightage** : **25%**  
**Last Dates for Submission** : **31<sup>st</sup> October, 2015 (For July 2015 Session)**  
**30<sup>th</sup> April, 2016 (For January 2016 Session)**

**This assignment has two parts I and II (Advanced Internet Technologies and Computer Graphics & Multimedia) and each part is for 20 marks. Answer all the questions. Lab record for all the respective sessions (given in the MCSL-054 Lab Manual) for each course carries 20 Marks each. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the MCA Programme Guide for the format of presentation. If any assumptions made, please state them.**

**PART-I: MCS-051 (Advanced Internet Technologies)**

1. Develop a web page using servlet to display the details of books of servlet programming available in library. (4 Marks)
2. Write a JSP program for an organization, which displays a web page containing two web links one for personal details and other for future plan. When one click on *personal details* link, it goes to a JSP page which display personal details such as name DoB, designation etc. of the employees with their photographs. By clicking on link *future plan*, another JSP page will open, displaying the future expansion plan of the organization. (5 Marks)
3. Write a program using JDBC and JSP to display the name and address of all the candidates who have scored 50% or more in a Programming Quiz organised at your study centre. (7 Marks)
4. Create an XML document for saving accounts in a bank. (4 Marks)

**PART-II: MCS-053 (Computer Graphics and Multimedia)**

1. Write a program in C/C++ using OpenGL to draw a circle of orange colour and inside that draw a triangle of green colour. (3 Marks)
2. Write a program in C/C++ using OpenGL to draw a hard wire house as shown in figure given below. Use basic primitives of openGL. (4 Marks)

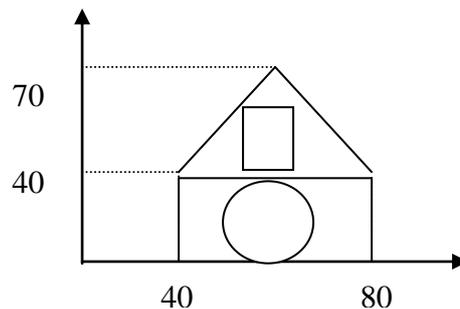


Figure: House

3. Write a program in C or C++ to implement Scan-Line Polygon Filling Algorithm. (6 Marks)

4. Write a program in C/C++ to implement Cohen-Sutherland line clipping algorithm. In this implementation consider two cases of a line: totally visible, totally invisible, against the rectangular clipping window. (7 Marks)

|                                  |   |   |
|----------------------------------|---|---|
| <b>Course Code</b>               | : | <b>MCSE-003</b>   |
| <b>Course Title</b>              | : | <b>Artificial Intelligence and Knowledge Management</b>   |
| <b>Assignment Number</b>         | : | <b>MCA(V)/E-003/Assignment/15-16</b>  |
| <b>Maximum Marks</b>             | : | <b>100</b>  |
| <b>Weightage</b>                 | : | <b>25%</b>  |
| <b>Last Dates for Submission</b> | : | <b>31<sup>st</sup> October, 2015 (For July 2015 Session)</b><br><b>30<sup>th</sup> April, 2016 (For January 2016 Session)</b> |

**This assignment has Ten questions and carries 80 marks. The rest of the 20 marks are for viva-voce. Answer all the questions. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.**

1. (a) Explain with suitable examples, significance of each of the following in solving problems: *(4 Marks)*
  - (i) Contextual information
  - (ii) Simultaneous availability of information
- (b) Explain with suitable examples, the tasks/ skills in which human beings are still superior to computers. *(4 Marks)*
2. (a) For each of the following formulae, construct a truth-table, and then determine whether it is valid, consistent or inconsistent: *(4 Marks)*
  - (i)  $(\sim C \rightarrow \sim D) \rightarrow (D \rightarrow C)$
  - (ii)  $((\sim C \vee D) \rightarrow B) \rightarrow (\sim C \rightarrow B)$
- (b) Determine whether the following equivalence between the formulae on two sides of '=' holds or not *(4 Marks)*

$$(Z \rightarrow X) \rightarrow (Z \rightarrow Y) = (Z \rightarrow X) \rightarrow Y?$$

by reducing each of the formulae on the two sides of '=' to one of the normal forms (DNF or CNF).
3. Translate first statements, given in the following argument into Propositional Logic, and then show that the conclusion logically follows from the premisses (given statements): *(8 Marks)*

**Premises:** Either taxes are increased, or if expenditures rise, then the debt ceiling is raised. If taxes are increased, then the cost of collecting taxes increases. If a rise in expenditures implies that the government borrows more money, then if the debt ceiling is raised, then interest rates increase. If taxes are not increased and the cost of collecting taxes does not increase, then if the debt ceiling is raised, then the government borrows more money. The cost of collecting taxes does not increase. Either interest rates do not increase or the government does not borrow more money.

**Conclusion:** Either the debt ceiling is not raised or expenditures do not rise.

You may use the symbols:

(T: Taxes are increased. E: Expenditures rise. D: The debt ceiling is raised. C: The cost of collecting taxes increases. G: The government borrows more money. I: Interest rates increase).

4. Transform the following formula first in Prenex Normal Form and then into Skolem Standard Form (8 Marks)

$$(\forall x) ( [(\forall y) (\exists z) (\sim P(x, y) \wedge Q(x, z))] \rightarrow (\exists u) R(x, y, u) )$$

5. Translate the following three statements in First Order Predicate Logic, and then deduce (iii) from (i) and (ii): (8 Marks)

**(You should not use resolution method)**

- (i) Lord Krishna is loved by everyone who loves someone.  
(ii) No one loves nobody  
(iii) Lord Krishna is loved by everyone.
6. (a) Write a recursive function in LISP named **partial-factorial** that takes two natural numbers  $m$  and  $n$  as arguments, and then computes *the product* of all natural numbers between  $m$  and  $n$  (including  $m$  both  $m$  and  $n$ ). It is not necessary that  $m$  is less than  $n$ . (4 Marks)

- (b) Write a PROLOG programme that answers questions about family members and relationships. Include predicates and rules which define sister, brother, father, mother, grandfather, grand-child and uncle. The programme should be able to answer queries such as the following: (4 Marks)

? – grandfather (X, mohan)  
? – grandchild (X, Y)  
? – uncle (phillips, mary)  
? – mother (ruksana, X)

7. (a) Give Semantic Net representation of the facts given below : (4 Marks)  
“Rohit is a businessman who deals in computer hardware products. The business is in partnership with Antony, Abdul and Shiv. Also, they have three employees for the business: Parveen, Shyam and Seema.

- (b) Create a frame network for terrestrial motor vehicles (cars, trucks, motorcycles) and give one complete frame in detail for cars which includes the slots for the main component parts, their attributes, and relations between parts. Include an as-needed slot for the gas of each type mileage. (4 Marks)

8. (a) For the following fuzzy sets: (2 Marks)

$$X = \{x/.5, y/.8, z/1, u/.3, v/1\} \text{ and} \\ Y = \{x/.6, y/.3, z/.4, u/1, v/0\}$$

$$\text{Find (i) } X \cup Y \quad \text{(ii) } X \cap Y \quad \text{(iii) } (X' \cap Y)'$$

- (b) Write a note on Non-monotonic reasoning systems. (3 Marks)

- (c) Write short note on each of (3 Marks)
- (i) default reasoning systems
  - (ii) closed world assumption systems.
9. Translate the following argument into FOPL and then using Deductive Rules of Inference (given in Unit 2 of Block 2) prove/ refute the following argument. (8 Marks)
- No man who is a candidate will be defeated if he is a good campaigner. Any man who runs for office is a candidate. Any candidate who is not defeated will be elected. Every man who is elected is a good campaigner. Therefore, any man who runs for office will be elected if and only if he is a good campaigner.
- You may use the notation*  
( $Mx, Cx, Dx, Gx, Rx, Ex$ )
10. (a) Describe briefly each of the components of an expert system shell. (4 Marks)
- (b) Discuss following types of task environments: (4 Marks)
- (i) fully observable vs. partially observable
  - (ii) static vs. dynamic
  - (iii) episodic vs. sequential
  - (iv) discrete vs. continuous

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|---------------------------|---|---|
| Course Code               | : | MCSE-004  |
| Course Title              | : | Numerical and Statistical Computing   |
| Assignment Number         | : | MCA(V)/E-004/Assignment/15-16   |
| Maximum Marks             | : | 100   |
| Weightage                 | : | 25%   |
| Last Dates for Submission | : | 31 <sup>st</sup> October, 2015 (For July 2015 Session)<br>30 <sup>th</sup> April, 2016 (For January 2016 Session) |

This assignment has two questions in all and carries 80 marks. The rest of the 20 marks are for viva-voice. Answer all the questions. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Not attending the viva leads to non evaluation of assignment

1. (a) Solve the following systems of simultaneous linear equations (10 Marks)  
using Gauss elimination method

(i)  $x_1 + x_2 + x_3 = 6$   
 $x_1 - x_2 - x_3 = 6$   
 $2x_1 + x_2 + 7x_3 = 12$

(ii)  $x_1 + 2x_2 + 3x_3 = 8$   
 $2x_1 + 4x_2 + 9x_3 = 8$   
 $4x_1 + 3x_2 + 2x_3 = 2$

Use partial pivoting to perform elimination in the solution of problems in (a).

- (b) Find the interpolating polynomial of appropriate degree for the (5 Marks)  
data, by Langranges method:

|   |    |    |   |   |    |
|---|----|----|---|---|----|
| x | -2 | -1 | 0 | 1 | 2  |
| f | -9 | -1 | 1 | 3 | 11 |

- (c) The functions below have roots in the intervals which are (5 Marks)  
specified on their right sides. Compute the roots of these functions in each of the intervals to an assured three significant figures by use of bisection method:

(i)  $e^x - 3x$ , on (0,1) and (1,2)

(ii)  $x^2 - \sqrt{x} - 2$  on (1,2)

- (d) Determine the roots of the functions in part (d) above using (5 Marks)  
secant method. Use the interval end points as initial values.

- (e) Use three-point formula/rule for  $f'(x)$  and  $f''(x)$  to obtain (5 Marks)  
estimates of the first and second derivatives of the functions listed below at the points.

$$x_i = \frac{i-1}{100} \quad 1 \leq i \leq 101$$

(i)  $\cos x$  (ii)  $x^3 + x^2 + x + 1$

- (f) Compute the integral (5 Marks)  

$$\int_0^1 (e^{x^2} - 1) dx \quad \text{and} \quad \int_0^2 (e^{x^2} - 1) dx$$
 by taking 10 points and using  
 (i) Trapezoidal rule (ii) Simpson's rule
- (g) Use the Euler method to solve numerically the initial value problem (5 Marks)  

$$\frac{dx}{dt} = -2t u^2; \quad u(0) = 1$$
- (h) Solve the above initial value problem using fourth order Runge-Kutta method. (5 Marks)
- (i) Write a computer program (in C or C++) to find the roots of a given non-linear equation by using Bisection method (5 Marks)
2. (a) Find the two lines of regression from the following data: (5 Marks)  
 Age of Brother: 25, 22, 28, 26, 35, 20, 22, 40, 20, 18.  
 Age of Sister : 18, 15, 20, 17, 22, 14, 16, 27, 75, 14.  
 Hence estimate  
 (i) The age of Brother when the age of his sister is 19, and  
 (ii) The age of sister when the age of her brother is 30.
- (b) The number of people who visit India Gate during week is normally distributed with a mean of 20,000 and a standard deviation of 600. Consider the probability that fewer than 12000 people visit in a week. (5 Marks)
- (c) Discuss the following : (20 Marks)  
 (i) Binomial Distribution  
 (ii) Poisson's Distribution  
 (iii) Normal Distribution  
 (iv) Chi-Square Distribution  
 (v) Residual Plots

|                                  |   |   |
|----------------------------------|---|---|
| <b>Course Code</b>               | : | <b>MCSE-011</b>   |
| <b>Course Title</b>              | : | <b>Parallel Computing</b>   |
| <b>Assignment Number</b>         | : | <b>MCA(V)/E-011/Assignment/15-16</b>  |
| <b>Maximum Marks</b>             | : | <b>100</b>  |
| <b>Weightage</b>                 | : | <b>25%</b>  |
| <b>Last Dates for Submission</b> | : | <b>31<sup>st</sup> October, 2015 (For July 2015 Session)</b><br><b>30<sup>th</sup> April, 2016 (For January 2016 Session)</b> |

**This assignment has eight questions in all and carries 80 marks. 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. The answers are to be given in your own words and not as given in the Study Material.**

1. Discuss each of the following concepts, with at least one appropriate example not discussed in course material. *(8 Marks)*
  - (i) Granularity in parallel/ concurrent environment
  - (ii) Speed-up
  - (iii) Scalability
  - (iv) Temporal Parallelism
  
2. (a) Use Bernstein's conditions for determining the maximum parallelism between the instructions in the following segment. *(4 Marks)*

S1:  $Y = X + Z$   
S2:  $Z = U + X$   
S3:  $S = R + V$   
S4:  $Z = Y + R$   
S5:  $P = N + Z$
  
- (b) Discuss essential features of each of the following scheme for classification of parallel computers: *(8 Marks)*
  - (i) Handler's (ii) Uniform Memory Access Model (iii) Non-Uniform Memory Access Mode I (iv) Cache-only Memory Architecture Model
  
3. (a) How the following properties can be used in determining the quality of an interconnection network: *(3 Marks)*
  - (i) Network diameter (ii) Latency
  - (iii) Bisection bandwidth
  
- (b) Discuss relative merits and demerits of Tree Interconnection Network vis-à-vis Systolic Array Network. *(3 Marks)*
  
- (c) For K-ary n-cube network calculate each of the following *(6 Marks)*
  - (i) Number of nodes in the network
  - (ii) The Network diameter
  - (iii) Bisection bandwidth of the network.

4. Write brief notes on any four of the following: (8 Marks)
- (i) Pipeline processing
  - (ii) Superscalar processor
  - (iii) VLIW architecture
  - (iv) Multi-threaded processor
5. (a) Using sorting algorithm for combinational circuit given in Section 1.7 of Block 2, sort the following sequence of numbers in increasing order. (6 Marks)
- 12, 8, 25, 30, 9, 52, 20, 14, 90, 40, 95, 0, 60, 23, 83
- (b) Using matrix multiplication algorithm given in Section 1.10, compute the following product: (4 Marks)
- $$\begin{pmatrix} 4 & 3 \\ 7 & 12 \end{pmatrix} \begin{pmatrix} 9 & 7 \\ 5 & 10 \end{pmatrix}$$
6. (a) Discuss relative merits and demerits of three types of implementations, viz., (6 Marks)
- (i) Message passing
  - (ii) shared memory
  - (iii) data parallel of PRAM model
- (b) Discuss Odd-Even Merging Circuit for sorting and then analyse for its complexity. (4 Marks)
7. (a) Enumerate different steps to write a general parallel programme. (4 Marks)
- (b) Discuss synchronization principle for parallel for multi-processing environment. (3 Marks)
- (c) Write a pseudo-code to find the product  $g(a) * g(b)$  of two functions in shared memory programming using library routines. (3 Marks)
8. (a) Discuss in detail synchronization problem and its possible solutions for performance and correctness of execution in parallel computing environment. (6 Marks)
- (b) Discuss briefly factors affecting parallel overheads (4 Marks)