

BACHELOR OF COMPUTER APPLICATIONS (BCA)

(Revised Syllabus)

BCA(Revised Syllabus)/ASSIGN/SEMESTER-IV

ASSIGNMENTS

(July - 2016 & January - 2017)

**(BCS-040, MCS-024, BCS-041, BCS-042,
MCSL-016, BCSL-043, BCSL-044, BCSL-045)**



**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 BCA 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 BCA Programme Guide.

Course Code	:	BCS-040
Course Title	:	Statistical Techniques
Assignment Number	:	BCA(4)/040/Assignment/16-17
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15 th October, 2016 (For July 2016 Session) 15 th April, 2017 (For January 2017 Session)

This assignment has sixteen questions in all and carries 80 marks. The rest of the 20 marks are for viva-voice. Answer all the questions, all questions carry equal marks (i.e., 5 marks each). 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.

NOTE: NOT ATTENDING THE VIVA LEADS TO NON EVALUATION OF ASSIGNMENT

1. If \bar{X} = mean of set n observations i.e., x_1, x_2, \dots, x_n , (5 Marks)
 σ_x = standard deviation of set of n observations
 Similarly \bar{Y} & σ_Y are mean and standard deviation of set of m observations. Show that standard deviation of pooled set $x_1, x_2, \dots, x_n, y_1, y_2, \dots, y_m$ for n + m observation is

$$\sqrt{\frac{n\sigma_x^2 + m\sigma_y^2}{n+m} + \frac{nm}{(n+m)^2}(\bar{x} - \bar{y})^2}$$

2. Consider a family with 2 children. Assume each child is as likely to be a boy as it is to be a girl. What is the conditional probability that both children are boys given that (i) the elder child is a boy (ii) at least one of the children is a boy. (5 Marks)
3. It has been claimed that in 60% of all Android Applications installation, the utility bill is reduced by at least one third. Accordingly, what is the probability that the utility bill we reduced by one third in (i) four of five installations (ii) at least four of five installations. (5 Marks)
4. If a Hardware support centre receives on an average $\lambda = 6$ wrong complaints per day, then what is the probability that it will receive 4 wrong complains on any given day. (5 Marks)
5. Verify whether the following situations can be described by uniform distribution or not. (i) The average life span of a bulb produced by manufacturing company, (ii) the number of defective items produced by assembly process. (5 Marks)

6. An individual's IQ score has $N(100, 15^2)$ distribution. Find the probability that the individual's IQ score is between 91 and 121. (5 Marks)
7. From a population of 200 observations, a sample of $n = 50$ is selected. Calculate the standard error, if the population standard deviation equals 22. (5 Marks)
8. A random sample of 100 observations is taken from a normal population having variance $\sigma^2 = 42.5$. Find the approximate probability of obtaining a sample standard deviation between 3.14 and 8.94. (5 Marks)
9. If independent random samples of size $n_1 = n_2 = 8$ come from normal populations having the same variance, what is the probability that either sample variance will be at least seven times as large as the other? (5 Marks)
10. A random sample of 800 computers contains 24 defective items. Compute 99% confidence interval for the proportion of defective computers. (5 Marks)
11. An Antivirus developer claims that it cleans the entire system in 5 minutes (with standard deviation of 2 minutes). Ten people volunteer to take it to test the claim. The average time to get the system cleaned was 7.5 minutes. Do you accept the claim at 10% level. (5 Marks)
12. A random sample of size 1000 from lot of computers supplied by manufacturer - 1, contains 20 defectives and a random sample of size 1500 from computers supplied by manufacturer - 2 contains 40 defectives. If $\alpha = 0.05$, can you say computers supplied by manufacturer - 1 are better than those supplied by manufacturer - 2. (5 Marks)
13. A software company owner has 3 developers A, B and C. During a particular week, the owner tried to evaluate the productivity of A, B and C (x software developer was on leave) (5 Marks)

Day → Developer ↓	1	2	3	4	5
A	6	8	6	5	*
B	7	8	7	5	8
C	9	8	*	6	*

Prepare a summary table, present the ANOVA table and test (at 5% level) whether all three (A, B, & C) are equally productive or not.

- 14.** An economist wants to estimate relationship in a small community (5 Marks)
between a family's annual income & amount that family serves.
Following data of 9 families obtained.

Annual income (thousand dollar)	12	13	14	15	16	17	18	19	20
Annual savings (thousand dollar)	0	0.1	0.2	0.2	0.5	0.5	0.6	0.7	0.8

Calculate the least square regression line.

- 15.** Fit the trend curve to the population data given below, using second (5 Marks)
degree equation, i.e., $T_t = a_0 + a_1t + a_2t^2$. Use $t = 1, 2, \dots, 10$. How
good is your fit.

Census	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
UP Population (10000 ²) Crores	1906	2144	2142	2420	2729	3111	3598	4350	5355	6651

- 16.** A sample of size 4 is to be selected from a population of 11 (5 Marks)
computer brands. List all the possible sample by (i) Linear
systematic sampling (ii) circular systematic sampling

Course Code : **MCS-024**
Course Title : **Object Oriented Technologies and Java**
Assignment Number : **BCA(4)/024/Assignment/16-17**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **15th October, 2016 (For July 2016 Session)**
15th April, 2017 (For January 2017 Session)

There are eight questions in this assignment which carried 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. Also in your programs give appropriate comments to increase understandability. Please go through the guidelines regarding assignments given in the Program Guide for the format of presentation.

1. (a) What is Object Oriented Programming? Explain basic components of Object Oriented Programming . *(6 Marks)*
- (b) Explain abstraction and encapsulation with the help of examples. *(2 Marks)*
- (c) Explain concept of java virtual machine. *(2 Marks)*
2. (a) Write a java program to demonstrate use of different operators available in java. *(4 Marks)*
- (b) Explain followings in context of java, with the help of examples. *(6 Marks)*
 - (i) Access specifiers and Inheritance
 - (ii) Application program and applet program
3. (a) Create array of objects in a java program and pass it as an argument in a method. *(2 Marks)*
- (b) Write a java program to demonstrate different use of **final** variable. *(2 Marks)*
- (c) Write a java program to create Ticket class with proper constructor, to create a railway ticket. Define a method to display ticket details. *(6 Marks)*
4. (a) What is polymorphism? It provides flexibility in application development? Yes or No? Justify your answer with the help of an example. *(3 Marks)*

- (b) Explain the need of package in Java. Explain accessibility rules for package. Also explain how members of a package are imported. Write java program to create your own package for finding area of different shapes *(7 Marks)*
- 5.** (a) What is abstract class? Explain need of abstract class with the help of an example. *(2 Marks)*
- (b) What is an exception? Explain how exceptions are handled in Java. Write a java program to handle different arithmetic exceptions while managing a medical store billing process. *(8 Marks)*
- 6.** (a) What is I/O stream in java? Write a program in java to create a file and count the number of words in it. *(4 Marks)*
- (b) Create an Applet program to display details of a quiz competition. Insert a background image in this program. *(4 Marks)*
- (c) Write and explain different constructors of String class. *(2 Marks)*
- 7.** (a) What is layout manager? Explain different layouts available in java for GUI programming. What is default layout of an applet? Explain how to set the layout of an applet. *(4 Marks)*
- (b) What is multithreading? Explain how threads are synchronized in java. *(3 Marks)*
- (c) Explain the need of JDBC? Explain steps involved in connecting a databases using JDBC. *(3 Marks)*
- 8.** (a) What is socket? Explain stream sockets and datagram sockets. *(3 Marks)*
- (b) What is RMI? Explain RMI architecture. *(3 Marks)*
- (c) What is servlet ? Explain servlet life cycle. *(4 Marks)*

Course Code	:	BCS-041
Course Title	:	Fundamentals of Computer Networks
Assignment Number	:	BCA(4)/041/Assignment/16-17
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2016 (For July 2016 Session) 15th April, 2017 (For January 2017 Session)

There are four questions in this assignment, which carries 80 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. Make suitable assumption is necessary.

1. (a) Explain the switching techniques used in ATM. Draw and explain structure of ATM cell format. *(6 Marks)*
- (b) What is a sub-netting and super-netting? How do you implement sub-netting? Explain this with an example. *(6 Marks)*
- (c) Explain the CSMA/CD Protocol with collision detection with the help of a diagram. *(4 Marks)*
- (d) What is the remainder obtained by dividing x^7+x^5+1 by the generator polynomial x^3+1 ? *(4 Marks)*
2. (a) Explain with the help of an example/illustration the problem with Distance vector routing algorithm. Explain in detail how does link state routing algorithm resolve the shortcoming of the above algorithm. *(8 Marks)*
- (b) Television channels are 8 MHZ wide. How many bits/sec can be sent if 8 level digital signals are used? Assume that this channel is noiseless. *(2 Marks)*
- (c) Describe and explain the throughput expression of Aloha and Pure Aloha. Consider the delay of Pure Aloha vs Slotted Aloha. Where will be less delay? Justify. *(8 Marks)*
- (d) A bit string 011111011101011110 needs to be transmitted at the Data-Link layer. What is the string actually transmitted after bit stuffing. *(2 Marks)*
3. (a) Analyze your computer lab in your study centre or college (in guidance of your teacher/ coordinator)and perform the following tasks:
 - (i) Draw diagram of your lab consisting of nodes (computers), hubs, switches bridges, type of cabling, servers and other various network devices. *(4 Marks)*

- (ii) Describe the network topology and its implementation in the lab. (3 Marks)
- (iii) Number of ports of the hub(s) with specifications. (2 Marks)
- (iv) Describe configuration / features of the server machine. (3 Marks)
- (v) List of applications running on the network with their brief description. (2 Marks)
- (vi) Describe briefly about the speed of the LAN and the protocol. (2 Marks)
- (vii) Describe the specification of cable used and its length. (2 Marks)
- (viii) Describe the networking features of the server operating system. (2 Marks)
4. (a) Draw the wireless LAN architecture and explain its components? Explain the functioning of the various wireless LAN Protocols? (6 Marks)
- (b) Explain the following in the context of Transport Layer: (8 Marks)
- Addressing scheme
 - Flow control and Buffering schemes
- (c) List different types of transmission media used in data communications. Write one advantage and one disadvantage of each. (4 Marks)
- (d) Explain the terms Bandwidth, Channel, Frequency, Amplitude used in Data Communication. (2 Marks)

Course Code : **BCS-042**
Course Title : **Introduction to Algorithm Design**
Assignment Number : **BCA(4)/042/Assignment/16-17**
Maximum Marks : **80**
Weightage : **25%**
Last Dates for Submission : **15th October, 2016 (For July 2016 Session)**
15th April, 2017 (For January 2017 Session)

There are nine questions in this assignment, which carries 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

1. How can big O-notation be used to estimate the sum of the first n positive integers. (5 marks)

2. Show how the following matrices should be multiplied using the Strassen's algorithm. (5 marks)

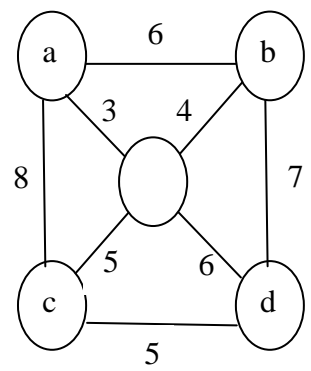
$$X = \begin{bmatrix} 4 & 3 & 2 & 6 \\ 5 & 4 & 3 & 0 \\ 7 & 6 & 5 & 3 \\ 6 & 3 & 5 & 7 \end{bmatrix} \text{ and } Y = \begin{bmatrix} 6 & 3 & 2 & 5 \\ 6 & 5 & 2 & 6 \\ 4 & 6 & 3 & 2 \\ 7 & 5 & 4 & 2 \end{bmatrix}$$

3. Using Induction method, show that for all the integers n $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ (5 marks)

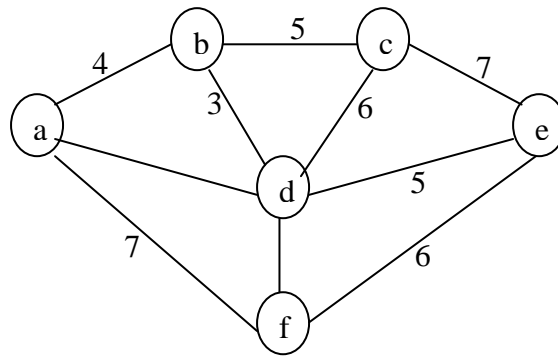
4. What is a recurrence relation ? Where it is used ? Write recurrence relation for the followings and explain it. (8 marks)

- (i) Binary Search Algorithm
- (ii) Merge Sort Algorithm
- (iii) Fibonacci Series Algorithm
- (iv) Quick Sort Algorithm

5. What are the applications of spanning tree. Write Prim's algorithm and apply it to the following graph to find out total cost of a minimum spanning tree. Show all the intermediate steps. Also, discuss time complexity of Prim's algorithm. (10 marks)



6. Define what is an optimization problem ? What are the tasks performed in Greedy method to solve optimization problem. Design a Greedy algorithm for Knapsack problem. We are given n objects and a Knapsack or a bag object. It has a weight W_i and the Knapsack has capacity m . If a fraction X_i , $0 \leq X_i \leq 1$, of object i is placed into the Knapsack, profit of $P_i X_i$ is earned. The objective is to fill the Knapsack in such a way as to maximize the total profit earning. (10 marks)
7. What are the properties of a shortest path. Write Bellman Ford's algorithm and apply it to the following graph. (10 marks)



Show all the intermediate steps of the algorithm.

8. Write Merge Sort algorithm and explain the operation of the algorithm with help of the following example. (7 marks)
70 30 20 80 40 90 25 50
9. Explain the following terms : (10 marks)
- (i) Adjacency matrix
 - (ii) Connected graph
 - (iii) Asymptote
 - (iv) Time complexity
 - (v) Branch and bound
10. Write a Pseudocode to perform a Linear Search Algorithm. Calculate the total number of comparison-operations, assignment-operations and how many times the loop will execute for finding the smallest number in an array ? (10 marks)

Course Code	:	MCSL-016
Course Title	:	Internet Concepts and Web Design (Lab Course)
Assignment Number	:	BCA(4)/L-016/Assignment/16-17
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2016 (For July 2016 Session) 15th April, 2017 (For January 2017 Session)

There are two questions in this assignment carrying a total of 40 marks. Your Lab Record will carry 40 Marks. Rest 10 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. Submit the screenshots along with the coding and documentation.

1. A Bus Company has a fleet of buses, which are operated on different tourist routes as per a fixed schedule. The company provides the details of all the routes including date and time of departure, price, total time taken etc. on its website. Create a web site for this company having the following features: (35 Marks)
- For the sake of consistency every page of the website should consist of four basic divisions –
- Header – This division should be of fixed size and should display company name, logo. This division should be in different background colour. This division should be at the top side of every page.
 - Footer – This division contains the name of developer and copyright information. This division should be at the bottom of every page.
 - Content – The pages that you are designing should differ in Content Division only. The five different page contents that you need to design are - Home, Tour List, Schedule, Booking and Contact us.
 - Menu – This division should be towards the left in every web page and should contain links to all the five web pages viz. Home, Tour List, Schedule, Booking and Contact us.

The Content division of the five different pages should be as under:

- *Home* page should include Welcome message, year of establishment of the company, turnover, size of company etc.
- *Tour List* page should give destination wise sorted list of various tours. This list should be displayed in a table.
- *Schedule* page should list the timing of buses to different destinations.

- *Booking* page should display the list of persons who have booked. This information should be displayed for every tour.
 - *Contact us* page should contain a form which should ask the details like name, tour number, contact phone etc. of the person who wants to find more information about a tour. You must use JavaScript to check that all the required fields are filled by the visitor.
2. Write a program using JavaScript / VBscript that checks if two matrices have identical values in all the elements. (This program is NOT a part of website, therefore, should be done separately.) (5 Marks)

Course Code	:	BCSL-043
Course Title	:	Java Programming Lab
Assignment Number	:	BCA(4)/L-043/Assignment/16-17
Maximum Marks	:	50
Weightage	:	25%
Last Dates for Submission	:	15th October, 2016 (For July 2016 Session) 15th April, 2017 (For January 2017 Session)

This assignment has three questions. Answer all the questions. These questions carry 40 marks. Rest 10 marks are for viva voce. You are advised to give proper comments and do proper alignments while writing java program. Please go through the guidelines regarding the assignments given in the programme guide for the format of presentation.

- 1.** Write and execute java program which create a shape class and derive circle and rectangle classes from shape class. All the classes in this program should have proper constructors and methods to display details of different shapes. Also use appropriate access specifiers in your program. *(10 Marks)*
- 2.** Write a program in java for exception handling for operating a Stack data structure. Throw appropriate exceptions in different cases (such as stack is full and attempt is made to push the data etc.) *(15 Marks)*
- 3.** Write a program in java to create an applet which draws a circle and display current date and time inside the circle. *(15 Marks)*

Course Code : **BCSL-044**
Title : **Statistical Techniques Lab**
Assignment Number : **BCA(4)/L-044/Assignment/16-17**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **15th October, 2016 (For July 2016 Session)**
15th April, 2017 (For January 2017 Session)

There are six questions in this assignment, which carries 40 marks. Rest 10 marks are for viva-voce. Answer all the questions. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

All the following questions must be performed using a statistical package. You may use any statistical package for this purpose.

1. The volume of milk contained in one liter packets (in liters) is given below. Perform the tasks given in (i) to (iv) using a spreadsheet package: (6 Marks)

1.004	0.994	1.076	1.063	0.964	1.171	0.995	1.076	1.011	1.111
1.000	0.968	1.056	0.999	1.001	0.959	1.001	0.977	1.101	0.959
0.984	1.036	1.013	0.984	1.161	0.975	0.980	1.013	1.001	1.010
0.977	1.045	0.993	1.058	0.991	1.091	0.925	1.054	1.034	0.949
1.023	1.012	0.934	1.066	0.979	0.986	1.013	1.014	1.000	1.024

- (i) Find the minimum and maximum volume using spreadsheet formula.
- (ii) Create 5 classes with suitable class interval and create the frequency distribution for volume using Array formula.
- (iii) Find the percentage of packets having volume less than a liter.
- (iv) Represent the frequency distribution with the help of a relevant graph.
2. Perform the following tasks using a spreadsheet (you must either enter necessary formula that are required to calculate the value or you may use spreadsheet function for the same): (6 Marks)
- (i) Given a population of 5000 and a sample size of 20 with a standard deviation of 10; calculate the standard error.
- (ii) A company manufactures nails of different lengths. The nails with length 2 inch should have a mean diameter of 3 mm. A sample of 100 nails was taken out of a lot consisting of 10000 such nails. The mean sample diameter was found to be 3.01 mm having a standard deviation of 0.03 mm. Assuming a confidence level of 95%, will you accept the nail lot. Justify your answer. Make suitable assumption, if any.

3. Measure control department checked the 5 kg weights of four different manufacturers. Four samples of each of these manufacturers were tested. The findings are given in the following table: (10 Marks)

Data on Five kg Weights

Sample	Manufacturer			
	A	B	C	D
1	5.05	5.02	5.21	4.88
2	4.99	4.97	5.15	5.01
3	5.01	4.89	5.09	4.89
4	5.03	4.87	4.93	5.00

Perform an ANOVA using any software to test (at 5% level) whether all the four manufacturers are producing proper weights. Make suitable assumptions, if any.

4. A Petrol filling station records the details of sales of petrol every day. The following table shows the sale of petrol by the company. Use spreadsheet software to find the moving averages for the length of 4 and 5. (6 Marks)

Day	Sale (Liters per day)
1	9507
2	8013
3	7000
4	6565
5	9989
6	4333
7	3000
8	2066
9	5505
10	3243
11	5067
12	4546
13	4333
14	6899
15	5459

5. A company manufactures pipes of 1 meter diameter. The company takes five observations of the diameter of the pipe on each day. These observations are taken 5 times during a working day. Calculate the control limits for mean and range, and plot the control charts using any statistical software. Make suitable assumptions, if any. (6 Marks)

The data is given in the following table:

Sample Days	The diameter of the pipe (meters)				
1	1.003	1.007	1.010	1.009	0.995
2	0.990	0.997	1.050	1.049	1.055
3	1.033	1.035	1.000	0.929	0.915
4	1.103	1.001	1.000	0.979	0.955
5	0.973	1.045	1.025	1.022	0.999

(Please take the suitable values of d_2 , d_3 , d_4 , A_2 and other variables.)

6. A stationery selling company sells stationery items as per the following table. Fit a trend using any statistical software to sales data for this company. Make suitable assumptions. (6 Marks)

Month	Mar	Apr	May	June	Jul	Aug	Sept
Sales (Units)	2000	8000	4000	1000	3000	3000	4000

Course Code : **BCSL-045**
Course Title : **Introduction to Algorithm Design Lab**
Assignment Number : **BCA(4)/L-045/Assignment/16-17**
Maximum Marks : **50**
Weightage : **25%**
Last Dates for Submission : **15th October, 2016 (For July 2016 Session)**
15th April, 2017 (For January 2017 Session)

There are seven questions in this assignment which carries 40 marks 10 marks are for viva-voce. You are required to run all the programs in C language and show the final result.

1. Write a program to perform matrix multiplication of 3 x 3 using Strassen's algorithm. Calculate total number of addition and multiplication operations while computing the matrix multiplication. *(6 marks)*

2. Implement a Bubble Sort algorithm for sorting the following list of numbers and showing the list obtained at each step. *(5 marks)*
17 10 7 9 25 30 8
Calculate the total number of exchange operations. How many times will the loop execute ?

3. Write a program to implement a connected graph (all vertices are connected to each other) with five vertices in form of an adjacency list and then implement DFS to find a Spanning Tree of the graph. *(6 marks)*

4. Given an ordered list of n integers and integer x. Find the number of comparisons used to determine the position of an integer x in the list using a Linear Search Algorithm. *(6 marks)*

5. Write a program to check whether a string is a palindrome or not and calculate *(6 marks)*
(a) Total number of swap operations
(b) Number of times the loop will execute.

6. Write a program to locate the last occurrence of the smallest element in a finite list of integers. How many comparison operations will occur ? *(5 marks)*

7. Implement Merge Sort algorithm to sort the following array *(6 marks)*

85	95	35	102	15	60	70	25	9
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