BACHELOR OF COMPUTER APPLICATIONS (BCA)

(Revised Syllabus)

ASSIGNMENTS

(July – 2024 & January - 2025)

(BCS-040, MCS-024, BCS-041, BCS-042,

MCSL-016, BCSL-043, BCSL-044, BCSL-045)

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THE PEOPLE'S UNIVERSITY

SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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CONTENTS

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(IV)040/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31st October, 2024 (For July session)
		30th April, 2025 (For January session)

Note: This assignment has 8 questions of 80 marks (each question carries equal marks). Answer all the questions. Answer all the questions. Rest 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.

Q1. In a partially destroyed laboratory, the legible record of analysis of correlation of data, is as follows: 10
Variance of x = 9, Regression equations: **(10 Marks)**
    i)   8x – 10y + 66 = 0
    ii)   4x – 18y – 214 = 0
What were (a) the means of x and y, (b) the coefficient of correlation between x and y and (c) the standard deviation of y?

Q2. A) A random sample of size 64 has been drawn from a population with standard deviation 20. The mean of the sample is 80. **(5 Marks)**
(i) Calculate 95% confidence limits for the population mean.
(ii) How does the width of the confidence interval change if the sample size is 256 instead?

B) A population consists of the numbers 2, 5, 7, 8 and 10. Write all possible simple random samples of size 3 (without replacement). Verify that the sample mean is an unbiased estimator of the population mean.
(5 Marks)

Q3. A computer chip manufacturer claims that at most 2% of the chips it produces are defective.
To check the claim of the manufacturer, a researcher selects a sample of 250 of these chips. If there are eight defective chips among these 250, test the null hypothesis that more than 2% of the chips are defective at 5% level of significance. Does this disprove the manufacturer's claim? (Given that $Z_{0.05} = 1.645$)
(10 Marks)

Q4. A) A problem of statistics is given to three students A, B and C whose chances of solving it are 0.3, 0.5 and 0.6 respectively. What is the probability that the problem will be solved? **(5 Marks)**
B) Suppose 2% of the items made in a factory are defective. Find the probability that there are:
(5 Marks)

    (i)   3 defectives in a sample of 100
    (ii)   no defectives in a sample of 50

Q5. A Manager of a car company wants to estimate the relationship between age of cars and annual

maintenance cost. The following data from six cars of same model are obtained as:

Age of Car (in years)	Annual Maintenance Cost (In hundred rupees)
1	10
2	15
3	18
4	20
5	25
6	35

(a) Construct a scatter diagram for the data given above. **(3 Marks)**

(b) Fit a best linear regression line, by considering annual maintenance cost as the dependent variable and the age of the car as the independent variable. **(2 Marks)**

(c) Use this regression line to predict the annual maintenance cost for the car of age 8 years.

(5 Marks)

Q6. What do you understand by the term forecasting? With the help of a suitable example discuss the relation between forecasting and future planning. Briefly discuss both forecasting model. **(10 Marks)**

Q7. Using the Regression line y =90 + 50x, fill up the values in the table below.

SAMPLE No. (i)	12	21	15	1	24
x_i	0.96	1.28	1.65	1.84	2.35
y_i	138	160	178	190	210
$\hat{y}_i$	138	-	-	-	-
$\hat{e}_i$	0	-	-	-	-

After filling the table, compute the parameters of Goodness to fit i.e. R and R^2. Based on the result of R and R^2, interpret the correlation between variable x and y. **(10 Marks)**

Q8. Explain the following with the help of an example each: **(10 Marks)**

(a) Linear and circular systematic sampling
(b) Z-test and t-test
(c) Correlation and Regression
(d) Probability Distribution

Course Code	:	**MCS-024**
Course Title	:	**Object Oriented Technologies and Java Programming**
Assignment Number	:	**BCA (IV)/024/Assignment/2024-25**
Maximum Marks	:	**100%**
Last Date of Submission	:	**31st October, 2024 (For July session)**
		30th April, 2025 (For January session)

There are Three questions in this assignment which carry 80 marks, in total. Rest 20 marks are for viva-voce. Answer all the questions. Give appropriate comments in programs to increase understandability. Wherever required, you may write java program, run it on machine and take its output as part of solution. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Q1: Give an example of a Project that is suitable for application of Procedural Programming rather than Object Oriented Programming. Justify your answer point wise in detail. **(30 marks)**

Q2: Give an example of a Project that is suitable for application of Object Oriented Programming rather than Procedural Programming. Justify your answer point wise in detail. **(30 marks)**

Q3: Give an example of a Project that is suitable for application of Object Oriented Programming and usage of Java Programming Language rather than any other Object Oriented Programming Language. Justify your answer point wise in detail. **(20 marks)**

Course Code	:	**BCS-041**
Course Title	:	**Fundamentals of Computer Networks**
Assignment Number	:	**BCA (IV)/041/Assignment/2024-25**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Date of Submission	:	**31ˢᵗ October, 2024 (For July Session)**
		30ᵗʰ April, 2025 (For January Session)

This assignment has eight questions for a total of 80 marks. Answer all the questions. Each question carries 10 marks. Rest 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.

Q1.
  (a) Differentiate between parallel and serial communication. Give an example of each.
  (b) Compare POP and IMAP.

Q2.
  (a) What is Ad hoc Wireless Communication System? Explain.
  (b) What is better for computer communication — analog or digital? Justify your answer.

Q3.   What is Windowing? How is flow control and reliability achieved through windowing at transport layer?

Q4.
  (a) Compare between CSMA/CD and Ethernet protocol. How does CSMA/CD resolve the problem of line connection? Explain.
  (b) Differentiate between circuit switching and virtual circuit. Also explain the effect of router failure in virtual circuits.

Q5.   Given data frame is 1101011011 and generator polynomial $G(x) = x^4 + x + 1$. Derive the transmitted frame using CRC method. Write all the steps involved in the process

Q6.   Differentiate between public key cryptography and private-key cryptography. Assume two prime numbers p and q are 13 and 17 respectively. Calculate private key and public key using RSA algorithm.

Q7.
  (a) Differentiate between pure ALOHA and slotted ALOHA. Give formulas for their throughput.
  (b) Explain the importance of Sliding Window Protocol. Also, list the types of sliding window techniques.

Q8.
  (a) Write the step-by-step working of Link State Routing. Also, compare it with Distance Vector Routing.
 (b) Explain leaky bucket algorithm for congestion control. Also list its advantages and disadvantages.

Course Code	:	BCS-042
Course Title	:	**Introduction to Algorithm design**
Assignment Number	:	**BCA(IV)/042/Assignment/2024-25**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last date of Submission	:	**31st October, 2024 (For July Session)**
	:	**30th April, 2025 (For January Session)**

This assignment has 8 questions of 10 Marks each, answer all questions. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Q1. For the function defined by
$f(n) = 2n^3 + 3n^2 + 1$ and $g(n) = 2n^3 + 1$: show that
(i) $f(n) = \Theta(g(n))$
(ii) $f(n) \mathrel{!=} \Theta(n^2)$
(iii) $n^4 \mathrel{!=} \Theta(g(n))$

Q2. Find the optimal solution for the knapsack instance n=7 and M=15
$(P_1, P_2, \text{--------------------} P_n) = (12, 4, 14, 8, 9, 20, 3)$
$(W_1, W_2, \text{--------------------} W_n) = (3, 2, 5, 6, 4, 1, 7)$

Q3. Apply Kruskal's Algorithm on the following graph to find minimum cost spanning tree
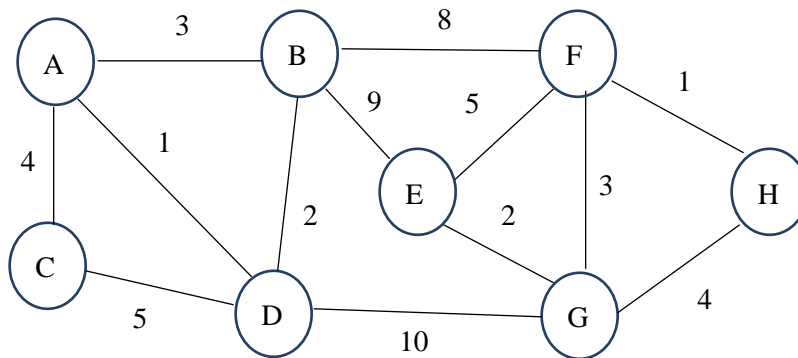
Q4. Apply Dijkastra's Algorithm to find the shortest path from source vertex 'A' to all other vertices for following graph.
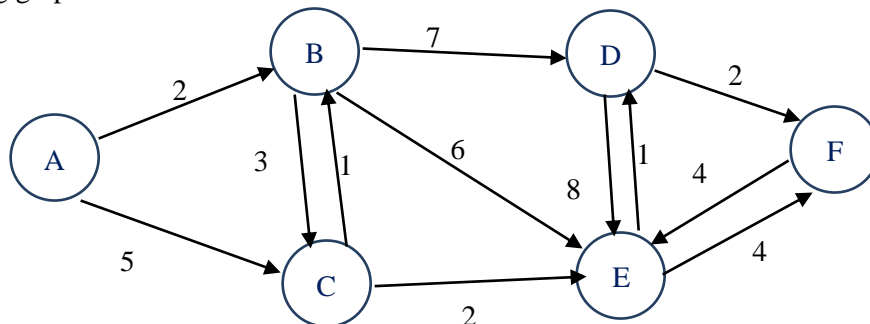
Q5. Analyze best case, average case, and worst-case time complexities of following algorithms with the help of suitable examples.
(i) Insertion sort

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(ii) Quick sort

(iii) Binary search

(iv) Selection sort

Q6. Multiply 2146782 x 0422812 using divide and conquer technique(use karatsuba method).

Q7. Explain DFS and BDS graph traversal algorithms with the help of a suitable example.

Q8. Write recurrence relations for matrixmultiplication using Strassen's method andsolve it using the Master method.

Course Code	:	MCSL-016
Course Title	:	Internet Concepts and Web Design (Lab Course)
Assignment Number	:	BCA(IV)/L-016/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2024 (For July Session)
		30th April, 2025 (For January Session)

There are two questions in this assignment carrying a total of 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 the presentation. Submit the screenshots along with the coding and documentation.

Question 1: **(70 Marks)**

A University maintains a website to display the programme wise list of students who were successful in its entrance examination and are eligible for admission. The website displays a list of programmes and for each programme a list of successful students. In addition, it also displays two forms – the first form allows student to register for the programme and second form is a feedback form about the website. Design and create four web pages for the e-Commerce company namely, *Home*, *Programmewise_student_list*, *Student_Registration* Form and *Feedback* form, having the following features:

For consistency, every webpage of website should consist of three basic divisions –

Heading – This division should be the same for all four web pages and should display the name and logo of the University. This division should have different background colour.

Menu - This division should be the same for every web page. It should contain links to all the web pages, viz. *Home*, *Programmewise_student_list*, *Student_Registration* Form and *Feedback* form.

Content - This division should display the basic information, as given below. The web pages that you are designing should differ in this Division only.

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

- The *Home* page should include a message from the Head of the University, welcoming all the successful students to the University.

- The *Programmewise_student_list* page should display information about all the Programmes of the University and under each programme it should display the list of successful students. You should display this information by using multi-level lists.

- The *Student_Registration* page should contain a form, which should have fields – Name of the Student, Programme, and Serial Number in the List. You should write JavaScript code to verify that all the fields are filled with some data. This code should be run when the Submit button is pressed.

- The *Feedback* page should display another form that has two input fields – The name of the student and a text area for giving the feedback. This form should have a Submit button.

Question 2: (10 Marks)

What are the advantages of using external style sheet along with an HTML web page? Explain with the help of an example. List the advantages of using Python for web development.

Course Code	**:**	**BCSL-043**
Title	**:**	**Java Programming Lab**
Assignment Number	**:**	**BCA(IV)/L-043/Assignment/2024-25**
Maximum Marks	**:**	**50**
Last date of Submission	**:**	**31ˢᵗ October, 2024 (For July Session)**
		30ᵗʰ April, 2025 (For January Session)

This assignment has two 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 program. Please go through the guidelines regarding the assignments given in the programme guide for the format of presentation.

Q1:

   (a) Write java program to find the simple interest on a savings account. Define appropriate class, constructor and methods in your program. Make necessary assumptions. **(10 Marks)**

   (b) Write a java program to print first 50 fibonacci numbers . Define appropriate class, constructor and methods in your program. **(10 Marks)**

Q2:

   (a) Write a program to demonstrate multilevel inheritance implementation. Make suitable provisions of exceptions handling in your program. **(10 Marks)**

   (b) Create an applet which take a number as input and display whether the given number is even or odd. If the input number is less than 1 then ask user to re-enter the input. Use appropriate components, layout and formatting in your program. **(10 Marks)**

Course Code	:	BCSL-044
Course Title	:	Statistical Techniques Lab
Assignment Number	:	BCA(IV)/L-044/Assignment/2024-25
Maximum Marks	:	50
Weightage	:	25%
Last Dates for Submission	:	31st October, 2024 (For July Session)
		30th April, 2025 (For January Session)

Note: 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.

Question 1: The weight of 50 adults in the age group 20-30 years, measured in Kilograms, is given below. Perform the tasks given in (i) to (iv) using a spreadsheet package: **(6 Marks)**

40	70	61	58	58	50	72	63	51	62
65	60	68	68	78	54	52	60	50	70
60	35	53	58	79	60	62	61	55	65
51	39	45	58	50	65	62	50	72	62
52	65	67	87	45	75	71	52	65	59

(i) Find the minimum and maximum weight using spreadsheet formula.
(ii) Divide the weight in 5 classes with class interval 10 and create the frequency distribution for these classes using Array formula .
(iii) Find the percentage of students, whose weight is in between 50 and 60 kgs.
(iv) Represent the frequency distribution with the help of a relevant graph.

Question 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) Calculate the standard error, given a population of 250, sample size 50 and population standard deviation of 25.
(ii) Assume that a company manufactures rings. The rings should have a mean diameter of 2cm. A sample of 20 such rings were taken out of 1000 such rings. The sample diameter of these rings was 2.01 cm with a standard deviation of 0.01 cm. Can the company say with 95% confidence that the rings should be accepted. Make suitable assumption and justify your answer.

Question 3: A paper making company experiments with quantity of paper being produced by four of its machine. Assuming that company has four such machines and productivity of these machine is recorded on four different days in the following table. **(10 Marks)**

Day	Quantity of paper per Machine			
	A	B	C	D
1	91	89	92	90
2	90	88	89	87
3	93	88	90	91
4	88	89	90	88

Perform an ANOVA using any software to test (at 5% level) whether all the four machines are equally productive. Make suitable assumptions, if any.

Question 4: The daily production of items of a company is given in the following table. Use spreadsheet software to find the moving averages for the length of 5. **(6 Marks)**

Day	Production (in Metric tons)
1	29
2	5
3	44
4	30
5	40
6	45
7	7
8	60
9	30
10	49

Question 5: A company manufactures refills of pens. Five observations of refills are taken on each day. These observations were taken 6 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 No.	Point size of pen in mm
1	2.04, 2.01, 1.87, 1.85, 1.90
2	2.14, 2.11, 1.97, 1.95, 2.10
3	1.99, 2.21, 1.77, 1.98, 1.98
4	2.00, 2.05, 1.97, 1.95, 2.01
5	1.87, 2.14, 2.19, 2.20, 2.15
6	2.06, 1.91, 2.17, 2.05, 1.90

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

Question 6: A company sells summer clothing. Fit a trend using any statistical software to sales data for this company. Make suitable assumptions. **(6 Marks)**

Month	Mar	Arp	May	June	Jul	Aug	Sept
Sales(in pieces)	400	700	2000	3000	2000	1000	200

Course Code	:	**BCSL-045**
Course Title	:	**Introduction to Algorithm design Lab**
Assignment Number	:	**BCA(IV)/L-045/Assignment/2024-25**
Maximum Marks	:	**50**
Weightage	:	**25%**
Last date of Submission	:	**31st October, 2024 (For July Session)**
	:	**30th April, 2025 (For January Session)**

Note: Answer all the questions which carry 40 marks. All questions are of equal marks.The rest 10 marks are for viva voce. You are required to write programs in C-language for all the problems , execute and show the results. 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. Make suitable assumption if necessary.

Q1.   Implement the Insertion Sort algorithm for sorting the following list of numbers in the ascending order, showing the list obtained at each step:

27, 15, 42, 3, 9, 29, 81, 54, 0, 13

Also calculate the total number of exchange operations and how many times the loop will execute in this algorithm. **(8 Marks)**

Q2.   Write a C program to implement the binary search algorithm. The program should first sort an array using any sorting algorithm and then search for a given element. Also, understand its efficiency.
(8 Marks)

Q3.   Write a program to implement to reverse the following a given 5-digit number and calculate the total number of times the loop construct executed. **(8 Marks)**

Q4.   Write a C program to implement *a stack* using a linked list with push, pop, and display operations.
(8 Marks)

Q5.   Write a C program to implement a binary tree and perform in-order, pre-order, and post-order traversals. Also, understand the efficiency of the program. **(8 Marks)**