

# **BACHELOR OF COMPUTER APPLICATIONS (BCA)**

## **(Revised Syllabus)**

BCA(Revised Syllabus)/ASSIGN/SEMESTER-IV

### **ASSIGNMENTS**

**(July – 2022 & January - 2023)**

**(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/2022-23**  
**Maximum Marks** : **100**  
**Weightage** : **25%**  
**Last Date of Submission** : **31<sup>st</sup> October, 2022 (for July session)**  
**15<sup>th</sup> April, 2023 (for January session)**

**Note: This assignment has 15 questions of 80 marks (Q.no.1 to 14 are of 5 marks each, Q15 carries 10 marks). 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 study on the Per capita Income for a particular year in a city, the following weekly observations were made. (5)

Per Capita Income (Rs.) - (1K=1000)	14K- 15K	15K- 16K	16K- 17K	17K- 18K	18K- 19K	19K- 20K
Number of Weeks	5	10	20	9	6	2

Draw a histogram and a frequency polygon on the same scale

**Q2.** Do you find any correlation between ages and playing habits of the students, whose distribution according to age groups is given in the following table (5)

Age of groups(Years)	15-16	16-17	17-18	18-19	19-20	20-21
Number of Students	200	270	340	360	400	300
Number of Regular players	150	152	170	180	180	120

**Q3.** Data are given below shows statistics viz. standard deviation & average marks secured by students, in the examination of subject A and B (5)

	<b>SUBJECT A</b>	<b>SUBJECT B</b>
<b>MEAN MARKS</b>	36	85
<b>STANDARD DEVIATION</b>	11	8

Assuming the Coefficient of correlation between A and B =  $\pm 0.66$

Perform the following tasks:

- i) Determine the two equations of regression
- ii) Calculate the expected marks in A corresponding to 75 marks obtained in B.

**Q4.** Calculate 2-sigma and 3-sigma upper and lower control limits for means of samples 4 and prepare a control chart for a drilling machine, which bores holes with a mean deviation of 0.5230 cm and a standard deviation of 0.0032 cm. (5)

**Q5.** Construct 5- yearly moving averages from the following data (5)

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SALE	105	107	109	112	114	116	118	121	123	124	125	127	129

**Q6.** In 120 throws of a single dice, following distribution of faces was observed. (5)

FACES	1	2	3	4	5	6	TOTAL
F <sub>0</sub>	30	25	18	10	22	15	120

From the given data, verify that the hypothesis “dice is biased” is acceptable or not.

**Q7.** A company wants to estimate, how its monthly costs are related to its monthly output rate. The data for a sample of nine months is tabulated below:

Out Put (Tons)	1	2	4	8	6	5	8	9	7
Cost (Lakhs)	2	3	4	7	6	5	8	8	6

Using the data given above, perform following tasks :

- Calculate the best linear regression, where the monthly output is the dependent variable and monthly cost is the independent variable.
- Use the regression line to predict the company’s monthly cost, if they decide to produce 4 tons per month.

**Q8.** The Probability that at least one of the two Independent events occur is 0.5. Probability that 5 first event occurs but not the second is (3/25). Also the probability that the second event occurs but not the first is (8/25). Find the probability that none of the two event occurs.

**Q9.** Marks of six students are tabulated below : (5)

Name :	Raj	Anil	Amit	Om	Rita	Renu
Marks :	54	50	52	48	50	52

From the population, tabulated above, you are suppose to choose a sample of size two.

- Determine, how many samples of size two are possible
- Construct sampling distribution of means by taking samples of size 2 and organize the data.

**Q10.** Two new types of petrol, called premium and super, are introduced in the market, and their manufacturers claim that they give extra mileage. Following data were obtained on extra mileage which is defined as actual mileage minus 10. (5)

Ordinary Petrol	1	2	2	1
Premium Petrol	2	2	1	3
Super Petrol	4	1	2	3

- (i) Using ANOVA, test whether premium or super gives an extra mileage.  
(ii) What is your estimate for the error variance?  
(iii) Assuming that the error variance is known and is equal to 1, obtain the 95 % confidence interval for the mean extra mileage of super.
- Q11.** Two floppies are selected at random without replacement from a box containing 7 good and 3 defective floppies. Let A be the event that the first floppy drawn is defective, and let B be the event that the second floppy drawn is defective.
- (i) Find the conditional probabilities  $P(B/A)$  and  $P(B/AC)$   
(ii) Show that  $P(B) = P(B/A) \cdot P(A) + P(B/AC) \cdot P(AC) = P(A)$ .
- Q12.** A drilling machine bores holes with a mean deviation of 0.5230 cm and a standard deviation of 0.0032 cm. Calculate 2-sigma and 3-sigma upper and lower control limits for means of samples 4 and prepare a control chart.
- Q13.** What are control charts briefly discuss the utility of control charts? (5)
- Q14.** Compare the following
- Cluster sampling, Stratified sampling and Systematic sampling
  - Parametric and Non-Parametric Tests
- Q15.** Explain the following with the help of an example each: (10)
- Goodness of fit test
  - Test of Independence
  - Criteria for a good estimator
  - Chi-Square Test

<b>Course Code</b>	:	<b>MCS-024</b>
<b>Course Title</b>	:	<b>Object Oriented Technologies and Java Programming</b>
<b>Assignment Number</b>	:	<b>BCA (4)/024/Assignment/2022-23</b>
<b>Maximum Marks</b>	:	<b>100%</b>
<b>Last Date of Submission</b>	:	<b>31<sup>st</sup> October, 2022 (for July session) 15<sup>th</sup> April, 2023 (for January session)</b>

**There are eight questions in this assignment which carried 80 marks. 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 Program Guide for the format of presentation.**

- Q1. (a)** What is Object Oriented Programming? Explain concept of encapsulation with example in java. (5)
- (b)** Explain use of different operators available in java. (5)
- Q2. (a)** What is a class ? Explain how you will define Book class in java. Also, explain use of getter and setter methods. (4)
- (b)** Explain use of super and final keywords in java. (3)
- (c)** Write a java program to find the factorial of a given number. (3)
- Q3.** Write a java program to create a Teacher class and define constructors for this class. Inherit Professor class, Associate\_Professor class, and Assistant Professor class from the Teacher class. Define appropriate methods to calculate salary of teachers. Show how to implement method overriding in this program. Make necessary assumptions. (10)
- Q4. (a)** Explain uses of abstract class in java with the help of an example. (4)
- (b)** Explain accessibility rules for packages in java. (2)
- (c)** What is polymorphism? Explain different types of polymorphism in java programming with the help of example. (4)
- Q5. (a)** What is interface? Explain difference between abstract class and interface with the help of examples. Write a java program to demonstrate use of interface. (5)
- (b)** What is an exception? Explain various causes of exceptions. Explain exceptions hierarchy in java. (5)

- Q6. (a)** What is multithreading? What is thread priority? Describe interthread communications in java with the help of a program. (7)
- (b)** Create an Applet to draw a triangle on the basis of input given by user. (3)
- Q7. (a)** What is object serialization? Explain advantage of object serialization. (2)
- (b)** What is need of layout manager? Explain different layouts available in java for GUI programming. Write code to set the layout of an applet. (8)
- Q8. (a)** What is RMI? Explain its use. (3)
- (b)** What is JDBC? Explain need of JDBC drivers. (3)
- (c)** What is Servlet? Explain use of GET and POST methods in Servlet. (4)

**Course Code** : **BCS-041**  
**Course Title** : **Fundamentals of Computer Networks**  
**Assignment Number** : **BCA (4)/041/Assignment/2022-23**  
**Maximum Marks** : **100**  
**Weightage** : **25%**  
**Last Date of Submission** : **31<sup>st</sup> October, 2022 (for July Session)**  
**15<sup>th</sup> April, 2023 (for January Session)**

**This assignment has four questions for a total of 80 marks. Answer all the questions. Each question carries 20 marks. Rest 20 marks are for viva voce.**

- Q1.** Given the network address 132.21.0.0, find the class, the block, and the range of the addresses. **(20 Marks)**
- Q2.** Compare 3G, 4G and 5G network architectures. **(20 Marks)**
- Q3.** What is parity bit method? Explain its use with the help of an example. **(20 Marks)**
- Q4.** What are the limitations of Amplitude Modulation. **(20 Marks)**



**Course Code** : **BCS-042**  
**Course Title** : **Introduction to Algorithm design**  
**Assignment Number** : **BCA(4)/042/Assignment/2022-23**  
**Maximum Marks** : **100**  
**Weightage** : **25%**  
**Last date of Submission** : **31<sup>st</sup> October, 2022 (For July Session)**  
: **15<sup>th</sup> April, 2023 (For January Session)**

**Answer all the questions in the assignment which carry 80 marks in total. 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Make suitable assumption if necessary. All algorithms should be nearer to C-language.**

**Q1.** Define time and space complexity of linear search algorithm. Calculate how many times the assignment operation will execute in the following code fragment (4)

```

for ( i = 0, i < n, i++)
for (j = 0, j < m, j++)
{
    x = x + 7;
}

```

**Q2.** For the function defined by  $f(n) = 3n^2 + 4n + 6$  and  $g(n) = n^2$ , (6)  
Check if the following are true or not?

- (i)  $f(n) = \Omega(g(n))$
- (ii)  $n^3 = \Omega(g(n))$
- (iii)  $f(n) \neq \Omega(n^4)$

**Q3. (a)** Write important features of Quick Sort algorithm. How is it different from Selection Sort and Insertion Sort algorithms in terms of the sorting processes? Apply Quick Sort algorithm to do sorting of the following array of integer numbers in ascending order. (6)

29	16	28	14	7	35	10	22	15	4
----	----	----	----	---	----	----	----	----	---

Write the pseudo-code and show all the intermediate processes of the running of the code/algorithm.

**(b)** Compute worst case and best case time complexities of Binary Search algorithm. When the worst and best cases of Binary Search algorithm would occur? Explain. (4)

**Q4. (a)** Describe the followings problems in brief and define its recurrence relation: (4)  
(i) Merge Sort Problem  
(ii) Karatsuba Method

**(b)** Define the recurrence relation of the following function (3)

```

f(n)
{
    If ( n= 1)
        return 2
    else
        return  $f(\frac{n}{4}) + f(\frac{n}{4}) + f(\frac{n}{4}) + f(\frac{n}{4}) + 10$ 
}

```

- (c) Solve the following recurrence relation using both Substitution and Master methods.

$$T(n) = 3T\left(\frac{n}{2}\right) + O(n) \quad (6)$$

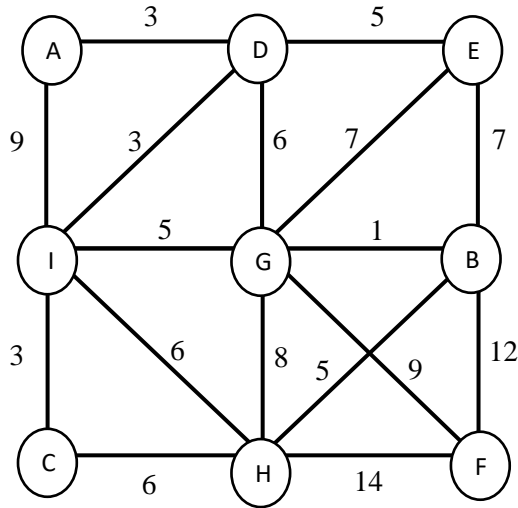
- Q5.** Write a Linear Search algorithm to search for number **36** in the following list of integer numbers. How many search operations will be required in this example. Show all the intermediate steps. (6)

85	65	47	41	9	35	18	25	36	14
----	----	----	----	---	----	----	----	----	----

Which are the other algorithms which perform better than the linear search algorithm? Discuss the worst case and average case time complexity of the algorithm.

- Q6.** What is the idea behind binary exponent evaluation? Write pseudo-code to compute  $a^n$  using right to left and left to right binary exponentiation algorithm and perform its complexity analysis. Apply the algorithm to compute  $a^{55}$  and calculate the total number of multiplication operations in this case. How many multiplication operations are required if brute force multiplication method is used in this example? Show all the intermediate steps. (6)

- Q7.** (a) Discuss the working of DFS and BFS algorithms with suitable examples. (6)
- (b) Write Kruskal's algorithm to calculate the minimum cost spanning tree of the following graph and calculate the time complexity of the algorithm. Show all the intermediate steps. (6)



**Q8.** Sort the following sequence using Bubble Sort algorithm. Show all the intermediate steps/ passes involved in sorting. (6)

25	27	15	35	13	50	33	14	40	27
----	----	----	----	----	----	----	----	----	----

**Q9. (a)** Write general form of Divide & Conquer and Greedy Techniques. (6)

**(b)** Formulate a Knapsack problem and apply it to find an optimal solution for the following Knapsack problem. Use any two approaches: (6)

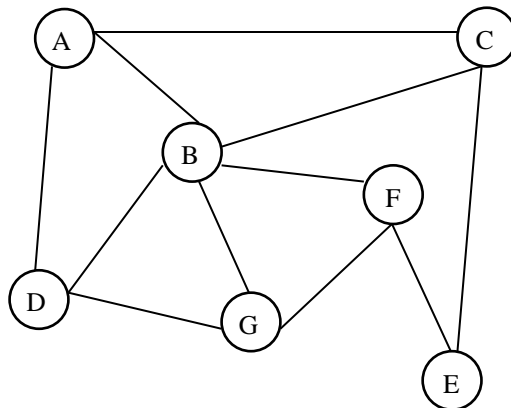
- Capacity of Knapsack: 23
- Number of Objects: 7

Profits  $P_i$  and weights  $W_i$  of objects are defined as follows:

$$(P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (13, 11, 18, 9, 7, 22, 5)$$

$$(W_1, W_2, W_3, W_4, W_5, W_6, W_7) = (7, 6, 8, 4, 6, 3, 5)$$

**Q10.** What is graph? List few applications of graph traversal schemes. For the following graph write adjacency list and adjacency matrix. (5)



<b>Course Code</b>	:	<b>MCSL-016</b>
<b>Course Title</b>	:	<b>Internet Concepts and Web Design (Lab Course)</b>
<b>Assignment Number</b>	:	<b>BCA(4)/L-016/Assignment/2022-23</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, 2022 (For July Session)</b> <b>15<sup>th</sup> April, 2023 (For January Session)</b>

**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 presentation. Submit the screenshots along with the coding and documentation.**

**Q1.** A Library maintains a website of its members and books issued to those members. The website displays the list of the members, number of books issued to them and contact number of the members. In addition, it also displays a form for the members who want to get a specific book issued. Design and create four web pages for the Library namely, *Home*, *Member\_List*, *Book\_Registration* Form and *Feedback*, having the following features: **(70)**

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

- Header - This division should be same for all the four web pages and should display name and logo of the Library. This division should be in different background colour.
- Menu - This division should be same for every web page. It should contain links to all the web pages, viz. *Home*, *Member\_List*, *Book\_Registration* Form and *Feedback*.
- 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:

- *Home page* should include a message from the Librarian, welcoming all the members to the website.
- *Member\_List* page should display information about all the members – name of member, number of books issued to them and contact number of the members. You should use a table to display this information.

- *Book\_Registration* page should contain a form, which should have fields – member name, phone number of the member, the title of the book that s/he wants to get issued, and a Submit button. 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.
- *Feedback* page should display another form that has three input fields – Name of member, subject of the feedback and a text area for giving the feedback. In addition, this form should have a Submit button.

**Q2.** List the advantages of using CSS. Explain the features of one latest web development software tool. **(10)**

**Course Code** : **BCSL-043**  
**Title** : **Java Programming Lab**  
**Assignment Number** : **BCA(4)/L-043/Assignment/2022-23**  
**Maximum Marks** : **50**  
**Last date of Submission** : **31<sup>st</sup> October, 2022 (for July Session)**  
**15<sup>th</sup> April, 2023 (for January Session)**

**This assignment has two questions. Answer both the questions. These questions carry 40 marks. Rest 10 marks are for viva voce. Write Java program and take its output as part of solution. Please go through the guidelines regarding the assignments given in the programme guide for the format of presentation.**

- Q1. (a)** Write a java program for Matrix Multiplication. Make necessary assumptions. (6)
- (b) Write a Java program to define Book class and appropriate constructor for the class. Define proper getter and sett methods for the class. Make necessary assumptions. (6)
- (c) Write a program to demonstrate use of: (8)
- i. Multithreading
  - ii. Exceptions Handling
- Q2. (a)** Write a program in Java which define an abstract class BankAccount. Using this class define some concrete classes. Make necessary assumptions. (10)
- (b) Write a program in Java to create an applet which draw either a rectangle or a circle on the basis of choice of input. (10)

**Course Code** : **BCSL-044**  
**Course Title** : **Statistical Techniques Lab**  
**Assignment Number** : **BCA(4)/L-044/Assignment/2022-23**  
**Maximum Marks** : **50**  
**Weightage** : **25%**  
**Last Dates for Submission** : **31<sup>st</sup> October, 2022 (For July Session)**  
**15<sup>th</sup> April, 2023 (For January 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.**

**Q1.** Weight of the students of a class of 30 students was recorded. This data is given in the following table. Perform the tasks given in (i) to (iv) on the data given below using a spreadsheet package: **(6)**

**(Weight in Kgs)**

45	57	60	59	45	56	67	75	70	39
65	60	47	42	41	53	49	67	42	50
52	44	45	70	58	44	55	41	45	75

- (i) Find the minimum and maximum weight using the spreadsheet formula.
- (ii) Create 5 classes with suitable class intervals and create the frequency distribution. You must use Array formula.
- (iii) Find the percentage of the students whose weight is less than the mean weight. Also find outlier in the data, if any.
- (iv) Draw the histogram for the data given in the table above. Is the data distribution of data normal distribution?

**Q2.** Perform the following tasks using spreadsheet software (you may use spreadsheet function for computing the value of **t**): **(6)**

- (i) Find the value of **t** for the given value of degree of freedom and significance level (**alpha**):
 

Degree of freedom	Significance
20	0.05
15	0.01
- (ii) A company manufactures rice bags of 10 kg weight. A sample of 50 such rice bags were taken out of a lot consisting of 2000 rice bags. The mean sample

weight was found to be 9.95 kg having a standard deviation of 0.06 kg. Assuming random sampling and a confidence level of 95%, will you accept the rice bags assuming that the difference in average weight is due to chance sample. Justify your answer. You should perform all computations using a spreadsheet software. Make suitable assumption, if any.

- Q3.** A hardware company produces disk brakes; the diameter of each disk brake is required to be exactly 250 mm. The company has four different machines to produce these disk brakes. Each day five samples of each machine are taken and the diameter of disk brakes is measured. The following tables lists these details:

**(10)**

**The size of disk brakes (in mm)**

Sample	Machine Identifier			
	A	B	C	D
1	251	250	249	251
2	252	249	251	252
3	250	249	251	248
4	249	248	251	247
5	249	249	249	251

Perform an ANOVA using any software to test (at 5% level) whether all the four machines are producing the disk brakes with correct length. Justify your findings. Make suitable assumptions, if any.

- Q4.** The rainfall in the first 15 days of July, 2022 is shown in the following table. Use spreadsheet software to find the moving averages for the length of 3 and 5. Also draw suitable graphs of these moving averages.

**(6)**

Day	Rainfall (mm)
1	50
2	55
3	5
4	12
5	13
6	0
7	0
8	11
9	0
10	0
11	5
12	0
13	110
14	150
15	130



- Q5.** A company packs sugar in a packet of 5 kg. The quality of process of producing the packets of sugar is controlled statistically. To do so, sample of five packets are taken at four different times of the day. Calculate the control limits for mean and range; and plot the control charts using any statistical software. Make suitable assumptions, if any. **(6)**

The data is given in the following table:

Sample id of the day	The weight of the packet of Sugar (in Kgs)				
1	5.054	5.025	4.995	4.999	5.008
2	5.091	4.992	4.995	5.011	5.010
3	5.014	5.021	5.016	5.032	5.064
4	5.025	5.013	5.032	5.039	4.993

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

- Q6.** The following table shows increase in the average temperature of a city in the month of June for the last 7 years. Fit a trend line using any statistical software to this temperature data. Make suitable assumptions. **(6)**

Year	2016	2017	2018	2019	2020	2021	2022
Avg Temperature	40.5	40.8	41.0	42.0	41.8	42.9	43.5

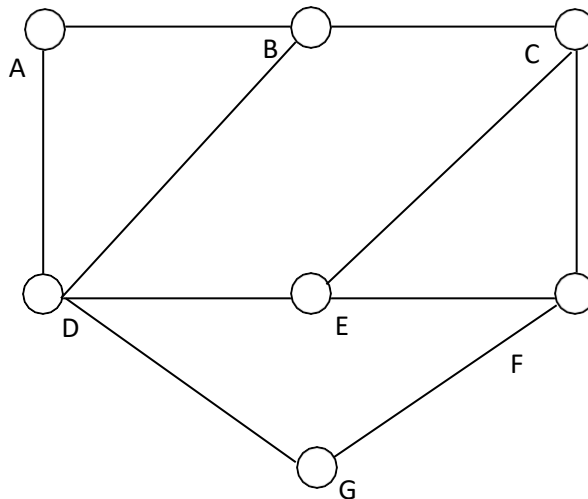
**Course Code** : **BCSL-045**  
**Course Title** : **Introduction to Algorithm design Lab**  
**Assignment Number** : **BCA(4)/L-045/Assignment/2022-23**  
**Maximum Marks** : **50**  
**Weightage** : **25%**  
**Last date of Submission** : **31<sup>st</sup> October, 2022 (For July Session)**  
: **15<sup>th</sup> April, 2023 (For January Session)**

**Note: Answer all the questions in the assignment having 40 marks in total. 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.** Write a program to implement Binary Search algorithm for an array consisting of at least 15 elements in the range 2 to 85. (6)
- Q2.** Write and test a program to sort the following array of integer numbers using Insertion Sort. Calculate the total no of comparison operations and the number of times the loop will execute. (7)

85	45	70	30	25	35	40	5	10	17
----	----	----	----	----	----	----	---	----	----

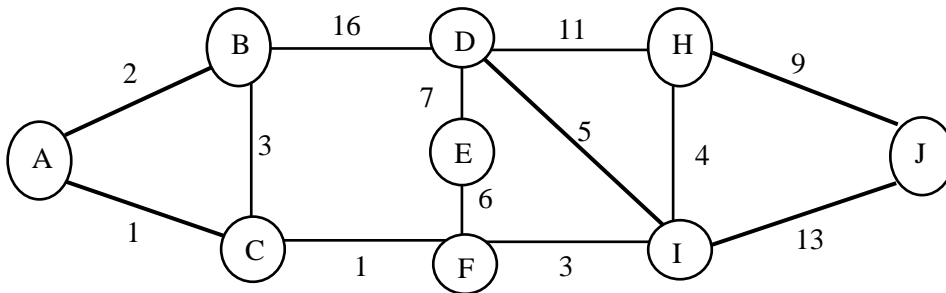
- Q3.** Write a program to traverse a graph using DFS. Apply this algorithm to the following graph and write the sequence of vertices to be travelled. Also calculate the number of times the loop(s) will execute. (7)



- Q4.** Implement Horner' rule for evaluating the following polynomial expression at  $x = 5$ . Calculate the total number of times additions and multiplication operations will occur in this example (6)

$$p(x) = 3x^5 - 4x^4 + 5x^3 - 6x + 9$$

- Q5.** Implement and apply Kruskal's algorithm to find a minimum cost spanning tree and test the result for the following graph: (7)



- Q6.** Implement Karatsuba's method using Divide & Conquer method to multiply two integer numbers. Test the result in multiplication of the following numbers and count the number of multiplication operations. (7)

$$532680 * 43286$$