

BACHELOR OF COMPUTER APPLICATIONS (BCA)

(Revised Syllabus)

BCA(Revised Syllabus)/ASSIGN/SEMESTER-IV

ASSIGNMENTS

(July - 2020 & January - 2021)

**(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(IV)-040/Assignment/2020-21**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **31st October, 2020 (for July, 2020 session)**
15th April, 2021(for January, 2021 session)

Note: This assignment has 16 questions of 80 marks (each question carries equal 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. What are the various probability distributions, give respective formulas of each type of distribution. Now solve the problem “The probability that at least one of the two independent events occurs is 0.5. Probability that the first event occurs but not the second is $\frac{3}{25}$. Also the probability that the second event occurs but not the first is $\frac{8}{25}$.” Find the probability that none of the two events occurs

Q2. Marks of six students are tabulated below:

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

From the population, tabulated above, you are supposed 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.

Q3. Given the following sample of 10 numbers

12 41 48 58 14 49 50 59 15 79

Compute Mean deviation and Standard deviation for the data given above.

Q4. 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.

- Q5.** A research was conducted to improve the safety plans in a factory. In this study, the accidental data of the factory for the last 50 weeks were compiled. These data are grouped into the frequency distribution as shown below:

Number of Accidents	Numbers of Weeks
0-5	8
5-10	22
10-15	10
15-20	8
20-25	2

Draw a histogram and calculate the average number of accidents per week.

- Q6.** A cricket ball manufacturing company wants to check the variation in the weight of the balls. For this, 25 samples each of size 4, are selected and the weight of each ball is measured (in grams). The sum of the sample average and the sum of Sample ranges were found to be $\sum_{i=1}^{25} \bar{x}_i = 4010$ Grams and $\sum_{i=1}^{25} R_i = 72$ grams, respectively. Computer the control limits for the \bar{X} and R-charts. It is given that $A_2 = 0.729$, $D_3 = 0$ and $D_4 = 2.282$.
- Q7.** An insurance company insured 1000 scooter drivers, 3000 car drivers and 6000 truck drivers. The probabilities that the scooter, car and truck drivers meet with an accident are 0.2, 0.04 and meets with an accident. What is the probability that he is a car drivers ?
- Q8.** A researcher would like to test whether there is any significant difference between the proportion of safety consciousness of men and women while driving a car. In a sample of 300 men, 130 said that they used seat belts. In a sample of 300 women, 90 said that they used seat belts. Test the claim that there is no significant difference between the proportion of safety consciousness of men and women while driving a car at 5% level of significance. (Given that $Z_{0.025} = 1.96$)
- Q9.** A company manufactures two types of bulbs, (A and B). The manager of the company tests a random sample of 50 bulbs of type A and 60 bulbs of type B and obtains the following information:

	Mean Life (in hours)	Standard Deviation (in hours)
Type A	1300	50
Type B	1200	60

Obtain 99% confidence interval for the difference of the average life of the two types of bulbs.(Given that $Z_{0.005} = 2.58$)

Q10. A washing machine company chooses a random sample of 10 motors received from one of the suppliers. It determines the length of life of each of the motors. The results (in thousands of hours) are as follows: 4.5, 5.0, 4.2, 4.8, 4.2, 5.1, 4.0, 4.2, 4.2, 4.5
 Computer a point estimate of the mean length of life of the motors received from the supplier.

Q11. A steel rod is subjected to stress. The tensile strength of the rod at different values of the stress are recorded. Find a relation between the tensile strength and the stress. The data is given below:
 Stress (kg): 10 9 7 8 11
 Tensile strength: 6 3 2 4 5
 Also predict the tensile strength at a stress of 5 kg.

Q12. A computer engineer identifies four ways that a certain job can be done. To determine how long it takes operators to do the job when each of these methods is used, the engineer asks four operators to do the job using the method A, another four operators to do the job using method B, and so on. Each operator's time (in seconds) is shown below:

A	B	C	D
19	18	21	22
17	16	20	23
22	15	19	21
20	14	19	20

Construct the relevant analysis of variance table and test the hypothesis that the average time of all operators are equal at 1% level of significance. (Given that $F_{0.01(3, 12)} = 5.95$)

Q13. The following contingency table presents the analysis of 300 persons according to hair colour and eye color:

		Eye Color		
		Blue	Gray	Brown
Hair Color	Fair	30	10	40
	Brown	40	20	40
	Black	50	30	40

Test the hypothesis that there is an association between hair colour and eye colour at 5% level of significance. (Given that $\chi^2_{0.05,4} = 9.49$)

Q14. Suppose an analyst studies three villages having population $N_1 = 50000$, $N_2 = 30000$ and $N_3 = 40000$, respectively. A stratified random sample is to be taken with a total sample size of $n = 500$. Determine the sample size to be selected from each village individually using the method of (i) proportional, and (ii) optimal allocation. From the previous survey, it is known that the standard deviations are $S_1=30$, $S_2=15$ & $S_3=20$.

Q15. Distinguish between

- a. Random sampling and Non-Random sampling.
- b. Parametric and Non- Parametric tests.
- c. Linear systematic sampling and Circular systematic sampling
- d. Binomial Distribution and Poisson Distribution

Q16. Explain the following.

- (a) Goodness of Fit Test
- (b) Time series Analysis
- (c) Forecasting
- (d) Control Charts

Course Code	:	MCS-024
Course Title	:	Object Oriented Technologies and Java Programming
Assignment Number	:	BCA (4)/024/Assignment/2020-2021
Maximum Marks	:	100%
Weightage	:	25%
Last Dates for Submission	:	31st October, 2020 (for July, 2020 session) 15th April, 2021(for January, 2021 session)

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 readability/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 (OOP)? Explain its advantages. Also describe concept of data hiding in OOP. **(4 Marks)**
- (b) Explain different data types available in Java. **(4 Marks)**
- (c) Describe features of Java programming language. **(2 Marks)**

Q2.

- (a) What is a class? Define a class in Java and with the help of that class describe meaning of data members and member functions. Also describe use of different types of access spcifiers available in Java. **(6 Marks)**
- (b) Describe advantages of abstract method. Write a java program to create a Shape class with an abstract method Find_Area(). Inherit Circle and Rectangle classes from Shape class. Implement Find_Area() method in derived classes. Make necessary assumptions. **(4 Marks)**

Q3.

- (a) Explain use(s) of following keywords of Java with the help of program/example. **(6 Marks)**
 - i. final
 - ii. finally
 - iii. super
- (b) What is interface? How interface is different from abstract class? Write a program in Java to explain how interfaces are implemented. **(4 Marks)**

Q4.

- (a) What is polymorphism? Explain use of polymorphism in java programming. **(4 Marks)**
- (b)What is exception? What are different types of exceptions? Explain need of exceptions handling with the help of a program. **(6 Marks)**

Q5.

(a) What is multithreading? Explain advantages of multithreading. Describe use of setPriority and getPriority methods for Java multithreading. Also describe how threads are synchronized in Java with the help of a program. **(6 Marks)**

(c) Write program to create an Applet which draw a circle inside a triangle. Keep color of circle blue and triangle yellow. **(4 Marks)**

Q6.

(a) What is layout manager? Describe use of flow layout and grid layout with the help of program code. **(6 Marks)**

(b) What is event driven program? Describe different components of event in Java. **(4 Marks)**

Q7.

(a) Explain use of stream classes in Java. Write a java program to read the contents of a given file and display it. **(6 Marks)**

(b) Explain use of Socket and DatagramPacket classes. **(4 Marks)**

Q8.

(a) What is Servlet ? Explain Servlet life cycle. Also explain use of GET and POST methods of Servlet. **(4 Marks)**

(b) What is JDBC? Explain how connection is established in JDBC. **(3 Marks)**

(c) What is RMI? Explain RMI architecture. **(3 Marks)**

Course Code : **BCS-041**
Course Title : **Fundamentals of Computer Networks**
Assignment Number : **BCA (4)/041/Assignment/2020-2021**
Maximum Marks : **100**
Weightage : **25%**
Last Date of Submission : **31st October, 2020 (for July, 2020 session)**
15th April, 2021(for January, 2021 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. What are Microwaves ? Explain their properties.

Q2. What are Switched Communication Networks ?

Q3. How many different phase states are used in BPSK and QPSK?

Q4. Explain the need of layering in the Data Communications Protocols Stack.

Course Code : **BCS-042**
Course Title : **Introduction to Algorithm design**
Assignment Number : **BCA(4)/042/Assignment/2020-21**
Maximum Marks : **80**
Weightage : **25%**
Last date of Submission : **31st October, 2020 (for July, 2020 session)**
15th April, 2021(for January, 2021 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 complexity of an algorithm and calculate how many times the assignment operation will execute in the following code fragment **(2 Marks)**

```

for( i = 1, i <= n, i++)
for( j = 1, j <= m, j++)
{
    x = x + 1;
}

```

Q2. For the function defined by $f(n) = 6n^3 + 6n^2 + 1$ **(6 Marks)**
 $g(n) = 6n^2 + 7$

Show the followings:

- (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 Bubble Sort algorithm. How is it different from Selection Sort and Insertion Sort algorithms in terms of the sorting processes? Apply Bubble Sort algorithm to do sorting of the following array of integer numbers in ascending order. **(6 Marks)**

33	17	27	14	6	45	11	22	15	5
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Write the pseudocode and show all the intermediate processes of the running of the code/algorithm

(b) Compute worst and best cases of time complexities of algorithm. When the worst and best cases of Bubble Sort algorithm would occur? Explain **(4 Marks)**

- Q4. (a)** Describe the followings problems in brief and define its recurrence relation: **(6 Marks)**
- (i) Binary Search Problem
 - (ii) Tower of Hanoi Problem

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

```
f(n)
{
    If ( n = 1)
        return 1
    else
        return f( $\frac{n}{3}$ ) + f( $\frac{n}{3}$ ) + f( $\frac{n}{3}$ ) + 13
}
```

- (c)** Solve the following recurrence relation using recurrence tree and iteration methods **(6 Marks)**

$$T(n) = T(n-1) + n$$

- Q5.** Write a Linear Search algorithm to search for a number **14** in the following list of integer numbers. How many search operations will be required in this example. Show all the intermediate steps. **(6 Marks)**

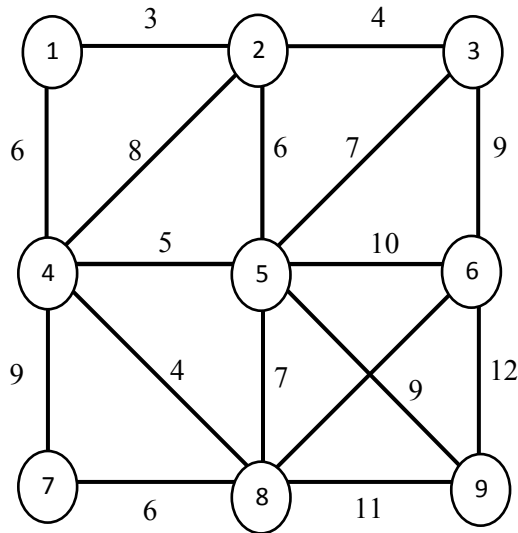
85	65	47	41	9	35	18	25	36	14
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Which are the other algorithms which perform better than the linear search algorithm? Discuss the worst case and average case time complexity of the algorithm.

- Q6.** What is the idea behind binary exponent evaluation? Write pseudocode 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 Marks)**

- Q7. (a)** Discuss the limitations and strengths of Kruskal's and Prim's algorithm **(4 Marks)**

- (b)** Write Prim'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 Marks)**



- (c) Answer the following questions related to run time behavior of this problem? **(4 Marks)**
- How many times the loop will run?
 - How many times the statements within the loop will run in each iteration?

Q8. Write and apply the partition procedure of Quick Sort algorithm to the following array. Show all the intermediate steps. **(6 Marks)**

25	27	15	35	13	50	33	14	40	27
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Q9. (a) Write a general form of Greedy Technique. **(4 Marks)**

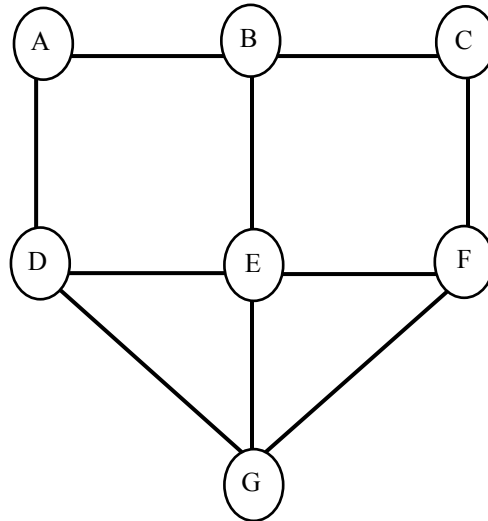
- (b)** Formulate a Knapsack problem and apply it to find an optimal solution for the following Knapsack problem. Use any two approaches: **(6 Marks)**
- Capacity of Knapsack: 25
 - Number of Objects: 7

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

$$(P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (15, 10, 20, 9, 7, 26, 5)$$

$$(W_1, W_2, W_3, W_4, W_5, W_6, W_7) = (8, 6, 7, 4, 9, 5, 2)$$

Q10. List few applications of graph traversal schemes. For the following graph , **(5 Marks)** write its adjacency list and adjacency matrix



Calculate storage requirement and time required to find edges in both the cases

Course Code	:	MCSL-016
Course Title	:	Internet Concepts and Web Design (Lab Course)
Assignment Number	:	BCA(4)/016/Assign/2020-21
Maximum Marks	:	100 (including Lab Record Marks)
Weightage	:	25%
Last Dates for Submission	:	31st October, 2020 (For July, 2020 Session)
	:	15th April, 2021 (For January, 2021 Session)

There are two questions in this assignment carrying a total of 40 marks. Your Lab Record will carry 40 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: (35 Marks)

A University offers its programmes online. It allows students to take admission through an online form. The dates of online admissions are announced on the University website along with the details of the programmes on offer. Design and create four web pages for the website of the University namely, *Home*, *Programme List*, *Registration Form* and *Important Dates*, having the following features:

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

- Header – This division should be of the same for all the four web pages and should display name and logo of the University. This division should be in different background colour.
- Options - This division should be same in every web page and should be towards the left in every web page. It should contain links to all the web pages viz. *Home*, *Programme List*, *Registration* and *Important Dates*.
- Data - This division should display the basic information as given below. The web pages that you are designing should differ in this Division only.

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

- *Home* page should include Welcome message, the aims and objectives of the University and strengths of the University
- *Programme List* page should display information about the programmes of the University in a tabular form. The table should contain Programme Code, Programme name, duration, Medium of instruction, eligibility criteria and total fee of the Programme.
- *Registration* page should contain a form which should have fields - name of the student, email id, phone, qualification of student, programme being registered, and a Submit button. You should also write the JavaScript code to verify that all the fields are filled by the person registering for the University.
- *Important Dates* page should display the start date of admission, the last date of admission and start date of commencement of programme, using an unordered list.

Q2:

(5 Marks)

What is the need of CSS? What are its important features of CSS? What is Angular JS? How is Angular JS similar or different to JavaScript?

Course Code : **BCSL-043**
Course Title : **Java Programming Lab**
Assignment Number : **BCA(4)/BCSL-043/Assignment/2020-21**
Maximum Marks : **50**
Last date of Submission : **31st October, 2020 (For July, 2020 Session)**
: **15th April, 2021 (For January, 2021 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). (10 Marks)

Write java program to find simple interest on a Saving Account. Define appropriate class, constructor and methods in your program. Make necessary assumptions.

Q1(b). (10 Marks)

Write a java program to create two threads and using setName method assign name to them also using setPriority method assign priority to those threads. Make necessary assumptions.

Q2(a). (10 Marks)

Write a program in java to store a given paragraph in a text file. Make suitable provisions of exceptions handling in your program.

Q(b). (10 Marks)

Create an applet which take a number as input and display whether it is prime number or not. Use appropriate components, layout and formatting in your program.

Course Code : **BCSL044**
Course Title : **Statistical Techniques Lab**
Assignment Number : **BCA(4)/044/Assign/2020-21**
Maximum Marks : **50**
Weightage : **25%**
Last Dates for Submission : **31st October, 2020 (For July, 2020 Session)**
: **15th April, 2021 (For January, 2021 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 students of a class having 40 student 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 Marks)**

(Weight in Kgs)

42	54	60	55	49	46	55	38	65	40
61	46	47	42	51	53	59	57	46	60
52	54	50	60	58	44	49	39	48	56
47	53	52	57	55	44	51	47	61	43

- (i) Find the minimum and maximum weight using the spreadsheet formula.
- (ii) Create 6 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
- (iv) Draw the histogram for the data above. Also try to relate it to normal distribution curve.

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

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

Degree of freedom	Significance
15	0.05
8	0.10

- (ii) A company manufactures milk packets of 1 litre. A sample of 20 such packet were taken out of a lot consisting of 1000 packets. The mean sample volume was found to be 1.0025 litre having a standard deviation of 0.04 litre. Assuming random sampling and a confidence level of 95%, will you accept the milk packets. Justify your answer. Make suitable assumption, if any.

Q3: A Company produces brake liners of thickness 6.4 mm. The company has four different machines to produce break liners. Each day five samples of each machine are taken and thickness of the break liner is determined. The following tables lists these details:

(10 Marks)

The thickness of break lines (in mm)

Sample	Machine Identifier			
	A	B	C	D
1	6.4001	6.3999	6.3903	6.4000
2	6.4011	6.3965	6.3803	6.4009
3	6.4035	6.3923	6.3703	6.3990
4	6.4101	6.3910	6.3995	6.3910
5	6.4071	6.3900	6.3918	6.4030

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

Q4: Exchange rate of currency X against currency Y for the first 15 days of July, 2020 are 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 Marks)

Day	1 unit of X = units of Y
1	65
2	61
3	62
4	63
5	64
6	65
7	66
8	62
9	59
10	61
11	64
12	60
13	60
14	64
15	66

Q5: A company packs flour in packets of 5 Kilograms. The quality of process of producing the flour packet is controlled statistically. To do so, sample of five packets is 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 Marks)

The data is given in the following table:

Sample id of the day	The weight of the flour in 5 samples (in Kgs)				
1	5.10	5.25	4.95	5.30	5.08
2	5.19	5.02	5.10	5.16	4.91
3	5.04	5.11	4.92	4.89	4.93
4	5.05	5.14	4.98	4.92	5.13

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

Q6: The following table shows the sale of mobiles by a company in different months. Fit a trend line using any statistical software to this sales data. Make suitable assumptions.

(6 Marks)

Month	Jan	Feb	Mar	Apr	May	Jun	July
Sales (in No of Units)	2000	1900	1950	1800	1600	1600	1800

Course Code : **BCSL-045**
Course Title : **Introduction to Algorithm design Lab**
Assignment Number : **BCA(4)/L-045/Assignment/2020-21**
Maximum Marks : **50**
Weightage : **25%**
Last date of Submission : **31st October, 2020 (For July, 2020 Session)**
: **15th April, 2021 (For January, 2021 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 and test a program to sort the following array of 10 integer numbers **(6 Marks)** using Selection Sort . Calculate the numbers of times the outer loop, inner loop, **if** statement and swap operation will execute in this example. Show all the intermediate steps.

15	45	60	25	35	8	40	5	10	27
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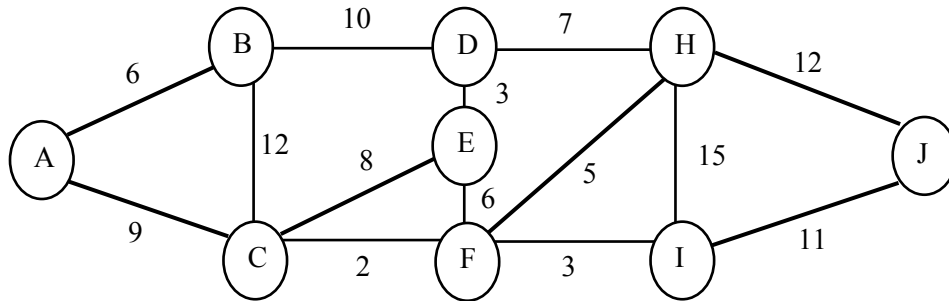
- Q2.** Implement Binary Search algorithm to search for a number **70** in the following sorted array of 10 integer numbers. Calculate the total no of **mid** operations, **if** statement and **else if** comparison operations and the number of times the loop will execute. **(6 Marks)**

5	10	25	30	37	46	55	60	65	70
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- 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 for loop and if condition will execute in this example. **(6 Marks)**

- Q4.** Write a program to find the maximum of the following list of integer numbers: **(5 Marks)**
15, 20, 5, 4, 3, 17, 35.
Calculate (i) the number of times the loop will execute and (ii) the number of times the **if** statement will run in this s example.

- Q5.** Implement Prim's algorithm to find a minimum cost spanning tree of the following graph and print the result. Represent the graph through adjacency matrix, **(6 Marks)**



- Q6.** Implement Horner's 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 **(5 Marks)**

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

- Q7.** Write a program to count the number of times an integer number 12 has occurred in the following array of 10 integer numbers. **(6 Marks)**

15, 20, 35, 12, 11, 8, 12, 7, 12, 16

Calculate the number of times (i) loop statement and (ii) increment operations will execute in this example.