

Disclaimer

Asslam o Alikum,

This is Daud Ahmad from UET KSK CS 19. This is a collection of past papers of different courses. It is highly recommended to not totally rely on these papers. If so, you may face it's consequences in the form of failure or lack of knowledge in concerned course. So, make your full preparation and then you can also prepare them as it's totally a chance.

Regards,

Daud Ahmad

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Total Marks: 20

Assessment#1

1. Create a class called Point that has two data members: x - and y -coordinates of the point. Provide a no-argument and a 2-argument constructor. Provide separate get and setfunctions for the each of the data members i.e. getX, getY, setX, setY. The getter functionsshould return the corresponding values to the calling function. Provide a display method todisplay the point in (x, y) format. Make appropriate functions const.
Derive a class Circle from this Point class that has an additional data member: radius of thecircle. The point from which this circle is derived represents the center of circle. Provide ano-argument constructor to initialize the radius and center coordinates to 0. Provide a 2-argument constructor: one argument to initialize the radius of circle and the otherargument to initialize the center of circle (provide an object of point class in the secondargument). Provide a 3-argument constructor that takes three floats to initialize the radius,x-, and y-coordinates of the circle. Provide setter and getter functions for radius of thecircle. Provide two functions to determine the radius and circumference of the circle.
Area
Write a main function to test this class.
2. The University of Engineering and Technology has several departments. Each department is managed by a chairperson, and at least one professor/lecturer. Professors must be assigned to one, but possibly more departments. At least one professor teaches each course, but a professor may be on sabbatical and not teach any course. Each course may be taught more than once by different professors. We know of the department name, the professor name, the professor employee id, the course names, the course schedule, the term/year that the course is taught, the departments the professor is assigned to, the department that offers the course. Draw an Entity Relation Diagram of the given scenario according to your understanding.

Final-Term Exam : Database Systems (CS-363)

Total Pts: 40

Term: Spring 2021

Date: August 04, 2021

Duration: 2 Hours

Student Name: David Ahmad **Student ID:** 2119-CS-620

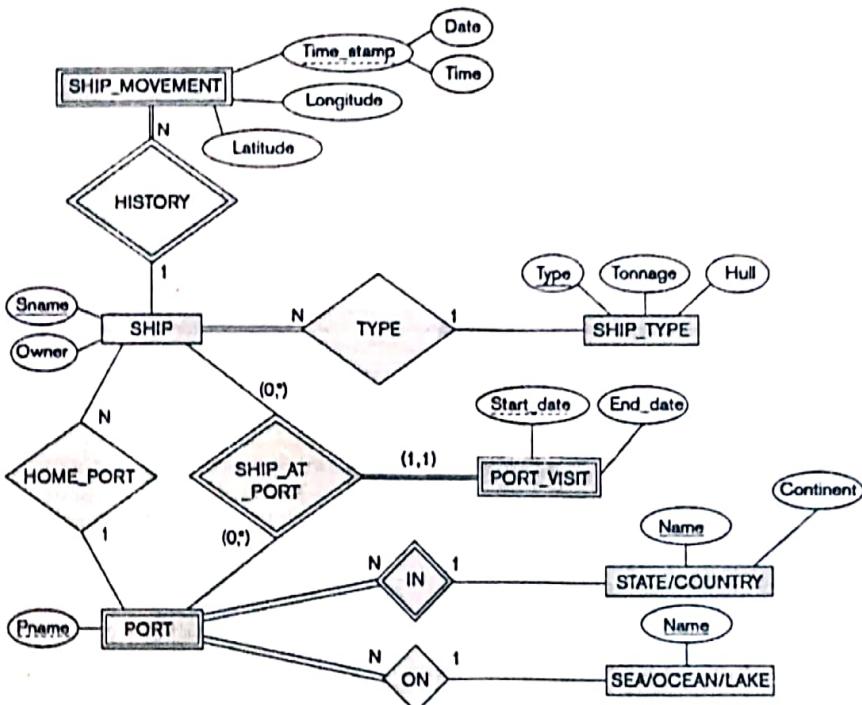
Question No 1: (10 pts)

(a) Design an enhanced entity-relationship diagram for the grade book database described below

GRADE_BOOK database help instructors record points earned by individual students in their classes. The data requirements are summarized as follows:

- Each student is identified by a unique identifier, first and last name, and an e-mail address.
- Each instructor teaches certain courses each term. Each course is identified by a course number, a section number, and the term in which it is taught. For each course he or she teaches, the instructor specifies the minimum number of points required in order to earn letter grades A, B, C, D, and F. For example, 90 points for an A, 80 points for a B, 70 points for a C, and so forth.
- Students are enrolled in each course taught by the instructor.
- Each course has a number of grading components (such as midterm exam, final exam, project, and so forth). Each grading component has a maximum number of points (such as 100 or 50) and a weight (such as 20% or 10%). The weights of all the grading components of a course usually total 100.
- Finally, the instructor records the points earned by each student in each of the grading components in each of the courses. For example, student 1234 earns 84 points for the midterm exam grading component of the section 2 course CSc2310 in the fall term of 2009. The midterm exam grading component may have been defined to have a maximum of 100 points and a weight of 20% of the course grade.

(b) The below figure shows an ER schema for a database that can be used to keep track of transport ships and their locations for maritime authorities. Map this schema into a relational schema(table structure) and specify all primary keys and foreign keys.



Question No 2: (10 pts)

(a) Consider the following relation:

CAR_SALE(Car#, Date_sold, Salesperson#, Commission%, Discount_amt).

Assume that a car may be sold by multiple salespeople, and hence {Car#, Salesperson#} is the primary key. Additional dependencies are

Date_sold → Discount_amt and Salesperson# → Commission%.

Based on the given primary key, is this relation in 1NF, 2NF, or 3NF? Why or why not? How would you successively normalize it completely?

(b) Consider the following relation:

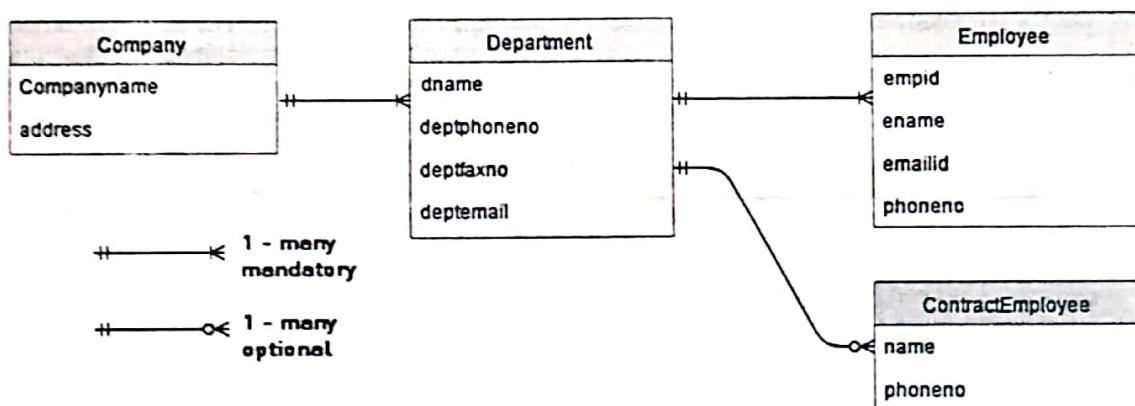
R (Doctor#, Patient#, Date, Diagnosis, Treat_code, Charge)

In the above relation, a tuple describes a visit of a patient to a doctor along with a treatment code and daily charge. Assume that diagnosis is determined (uniquely) for each patient by a doctor. Assume that each treatment code has a fixed charge (regardless of patient).

- Discuss which functional dependencies exist in this table.
- Is this relation in 3NF? Justify your answer and decompose if necessary.

Question No 3: (10 pts)

(a) Generate XML from the below diagram



(b) List down similarities and differences between XML and JSON.

Question No 4: (10 pts)

(a) Create a trigger that will cause an error when an update occurs that would result in a salary increase greater than ten percent of the current salary.

(b) What benefits NoSQL databases provide over relational databases.



Mid-Term Exam
Introduction to Human Computer Interaction (CS-302)

Term: Fall 2021

Time: 1.5 Hours

Date: November 8, 2021

Answer the following Questions

No.		CLO	Pts
Short Answers			
1	Identify any five different interaction style used to accommodate the dialog between user and computer and describe some paradigm shifts for interaction.	1	5
2	What is a conceptual model and how it is built up in a user's mind	1	5
A modern hotel has installed a sandwich making robot to supply room service sandwiches at any hour of the day. The hotel also has an automated delivery system that will take the completed sandwich to a specified room. You have been asked to program a software agent interface that guests can phone to order sandwiches.			
3	Write a short scenario describing how a guest would order a sandwich using your interface.	2	5
4	Provide a hierarchical task description of the sandwich ordering process. Note particularly where there might be choice points or alternative methods. Also explain your criteria for the level of decomposition used.	2	5
By default the Android Twitter app shows users notifications about all sorts of things like if they were mentioned in a tweet, if someone likes their tweet, if they get a new follower, etc. Some users like these notifications but others find them annoying. Figure 1 shows the sequence of screens necessary to disable notifications for "Mentions, replies, and photo tags". Answer the following questions about this sequence of screenshots:			
5	Use Heuristic Evaluation with 10 Heuristics to identify two positive and three negative aspects of this interaction sequence.	2	10



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a)

b)

c)

d)

e)

f)

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Paper: Final Term

Semester: Fall 2021

Time Allowed: 120 Minutes

Total Marks: 40

Subject: CS-381 Software Engineering

Section: A & B

Roll #: 2019-CS-620

Name: Ijaz Ahmad

Instructions: Please read me carefully

- All questions are compulsory.
- Be Specific to the question.
- Return the Question Paper with the answer sheet.

Sr. No.	QUESTIONS	MARKS	(CLOs)
I	To give an exam, an instructor first notifies the students of the exam date and the material to be covered. He then prepares the exam paper (with sample solutions), gets it copied to produce enough copies for the class, and hands it out to students at the designated time and location. The students write their answers to exam questions and hand in their papers to the instructor. The instructor then gives the exam papers to the TAs and sample solutions to each question and gets them to mark them. He then records all marks and returns the papers to the students. Draw a sequence diagram that represents this process. Make sure to show when each actor is participating in the process. Also, show the operation that is carried out during each interaction and what its arguments are.	8	(CLO2)
II	Consider the world of libraries. A library has books, videos, and CDs that it loans to its users. All library material has an id# and a title. In addition, books have one or more authors, videos have one producer and one or more actors, while CDs have one or more entertainers. The library maintains one or more copies of each library item (book, video, or CD). Copies of all library material can be loaned to users. Reference-only material is loaned for 2hrs and can't be removed from the library. Other material can be loaned for two weeks. The library records the user, the loan date and time, and the return date and time for every loan. The library maintains its name, address, and phone number for users. Draw a class diagram for the above-shared description.	8	(CLO2)
III	The Pizza Ordering System allows the user of a web browser to order pizza for home delivery. To place an order, a shopper	4+4	(CLO2)

	searches to find items to purchase adds items one at a time to a shopping cart and possibly searches again for more items. When all items have been chosen, the shopper provides a delivery address. If not paying with cash, the shopper also provides credit card information. The system has an option for shoppers to register with the pizza shop. They can then save their name and address information so that they do not have to enter this information every time that they place an order. Draw a use case and activity diagram for Pizza Ordering System.		
IV	Discuss the types of functional and non-functional testing in detail.	8+8	(CLO3)

😊 Wish you all the best 😊

2019-CS-620



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MIDTERM EXAM (FALL-2022)

Course: Introduction to parallel and distributed computing (CS-443)

Marks: 45 **Time:** 90 Minutes

Class: BSCS 7th

Session 2019 **Dated:** 04-11-2022

Question-1: Answer the following briefly (4x6+6) CLO-1 (Weightage=15)

- a) Differentiate SISD and SIMD architecture with suitable example.
- b) Write down at least four characteristics of GPU that differentiate it with CPU
- c) Differentiate cluster computing with grid computing. Write at least four aspects
- d) Draw a diagram presenting memory accesses by the processors of shared memory system of four processors and four memories in cross-bar.
- e) Give an example of a multiprocessor system having race condition, solve this race condition by using any synchronization technique.
- f) Describe Partitioned global address space (PGAS), which problem of parallel computing it solves?
- g) Count the cache misses in following both options if the MAX=6 and cache line is equal to 12 integers, please explain your computation properly.

Option-1
 $\text{for } (i = 0; i < \text{MAX}; i++)$
 $\quad \text{for } (j = 0; j < \text{MAX}; j++)$
 $\quad \quad y[i] += A[i][j] * x[j];$

Option-2
 $\text{for } (j = 0; j < \text{MAX}; j++)$
 $\quad \text{for } (i = 0; i < \text{MAX}; i++)$
 $\quad \quad y[i] += A[i][j] * x[j];$

Question-2: CLO-2 (Weightage=15)

a) Write a parallel program Using MPI API as per the following detail (10)

- It will take an array of signed integers; the length of array will be passed from command line and array will filled by user.
- Count the Number of positive integers by Four parallel processes, using scatter and gather functions of MPI.
- Count the number of positive integers entered by the user by sequential method.
- Compare the execution time by both techniques.
- Print the count of positive integers by both methods and the time difference of both methods.
- Please use barriers on the required locations and proper comments to clarify your code.

b) Implement the following Scenario in non-blocking mode using MPI (5).

Process-0

- Work for 2 seconds
- Initialize the send to process 1
- Work for 5 seconds
- Every 1ms, probe process 1 and communicate if necessary
- Initialize the second send to process 1
- Wait for process 1 to receive the data

Process-1

- Work for 6 seconds
- initialize receive from process 0
- Wait for a communication from process 0
- Work for 2 seconds
- initialize receive from process 0
- Wait for a communication from process 0



Department of Computer Science
University of Engineering and Technology Lahore, New Campus

Subject:
MA-224
Multivariate
calculus

Final Term
Exam Spring
2021

Reg no:
Time Limit: 90 mins

Section:
Total Marks: 40

-
- Attempt all the questions.
 - All the questions given below are taken from (CLO 2 & CLO 3) and each question is of equal marks.

Question 1:

State and prove Green's theorem for the spherical region. (with the help of figure)

Question 2:

Find the surface area of the surface cut from the bottom of the paraboloid
 $x^2 + y^2 - z = 0$, by plane $z = 4$.

Question 3:

Integrate $f(x, y, z) = x - 3y^2 + z$ over the line segment C joining the origin to the point $(1, 1, 1)$

Question 4:

(a) Find the area of the region cut from the first quadrant by the cardioid $r = 1 + \cos \theta$.

(b) Changing the order of integration then evaluate, $\iiint_0^4 \int_0^{2\pi} \int_{2y}^{4\cos x^2} dz dy dx$.

Good Luck

MID TERM EXAMINATION

Class: B.Sc Computer Science

Course Title: Numerical Methods

Reg NO: 2019-CS-620

Semester: 6th

Time: 60 minutes

Maximum Marks: 30

Note: Attempt all questions.

(a): Calculate one real root of $-x^3 + x^2 - x - 100 = 0$, using Newton Raphson method with initial approximation $x_0 = -4.2$, continue iteration process, till the absolute error between two consecutive iterations is correct to 4 decimal places, also write relation of convergence rate of Newton Raphson method with Bisection method. [CLO1] (12+13)

(b): Solve the following system by Gauss Seidal iterative method, correct to 4 decimal places

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

$$6x + 3y + 12z = 35$$

Q2: Drive relation $\mu^2 = 1 + \frac{\delta^2}{4}$, here ' μ ' represents average operator and ' δ ' represents central difference operator. [CLO2] (5)

FINAL TERM EXAMINATION

Class: B.Sc Computer Science

Semester: 6th

Course Title: Numerical Methods

Time: 90 minutes

Reg NO: 219-CS-626

Maximum Marks: 40

Note: Attempt all questions.

1(a): Given data

[CLO2] (12+13)

t (sec)	2	5	8	11
A (grams)	94.8	87.9	81.3	75.1

Construct a polynomial by Newton backward difference interpolation that satisfies given data.

1(b): Data is given in the following table; solve the integral $\int_0^{10} f(x) dx$, using the appropriate Simpson rule.

x	0	2.5	5.0	7.5	10
f(x)	0	18.25	75.0	168.75	300

Q2: Solve initial value problem $\frac{dy}{dx} = x + y$, $y(0) = 1$, $h = 0.1$, using RK-4, calculate $y(0.2)$, the exact solution of the problem is $y(x) = 2e^x - x - 1$, compute the absolute error between RK-4 and the exact solution and further sketch their graphs with proper legend. [CLO3] (15)

-6.2

-6.6

-6.9



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Paper: MID Term

Semester: Fall 2021

Time Allowed: 90 Minutes

Total Marks: 30

Subject: CS-441 Mobile Application Development

Section: A, B

Instructor: Usman Ahmed Raza

Date: 10-03-2022

Roll #: 2019-CS-620

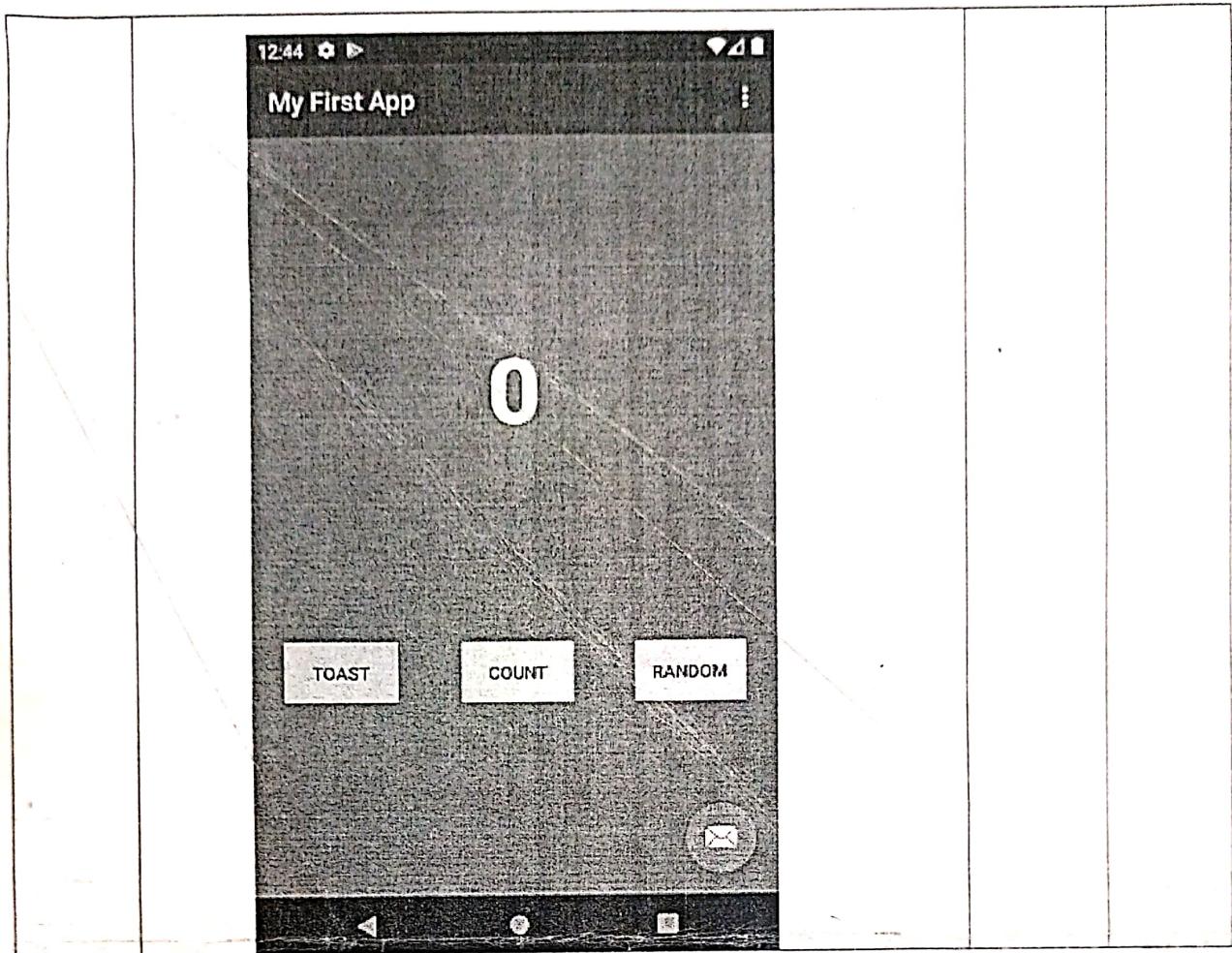
Name: David Ahmad

Instructions: Please read me carefully

- All questions are compulsory.
- Be Specific to the question.
- Return the Question Paper with the answer sheet.

Sr. No.	QUESTIONS	MARKS	(CLOs)
I	The android architecture contains a different number of components to support any android device needs. Discuss the main components of architecture with a diagram.	6	(CLO1)
II	Discuss the following terms: <ul style="list-style-type: none">• Ubiquitous Computing• Mobile Computing• Examples of the Position sensor• Examples of Environmental sensor	4	(CLO1)
III	Each day, thousands of mobile apps are published to the Google Play and Apple App Stores. Some of these mobile apps are games, others are social networks, and many are e-commerce apps. All of these apps, if professionally built, should follow a mobile app development process. Each app is different, and our methodologies are always evolving, but there is a fairly standard process when developing mobile apps. Kindly discuss the standard process from ideas generation to launch.	10	(CLO1)
IV	Explain the below-given figure and make an interactive app with 2 buttons, 2 edit text, and 2 text views, and write a java method to access the functionality.	6	(CLO2)

	 <p><u>FN</u></p> <p><u>LN</u></p> <p><u>Email</u></p> <p>REGISTER</p> <p>First Name</p> <p>Last Name</p> <p>Email</p>	
V	<p>Find the below-given figure and apply the following changes:</p> <ul style="list-style-type: none"> • Change the name of buttons to “Ok”, “Good”, “Best” respectively • Color of the button to Red • The background color of the layout to yellow • Show the toast Message “15” 	4 (CLO2)



😊 Wish you all the best 😊



Department of Computer Science, New Campus
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Paper: Final Term

Semester: Spring 2022

Time Allowed: 120 minutes

Total Marks: 40

Subject: CS-441 Mobile Application Development

Section: A, B

Instructor: Usman Ahmed Raza

Weightage: 75%

Roll #: _____

Name: _____

Instructions: Please read me carefully

- All questions are compulsory.
- Be Specific to the question.
- Return the Question Paper with the answer sheet.

Sr. No.	QUESTIONS	MARKS	(CLOs)
I	Discuss the following terms: <ul style="list-style-type: none">• Web View• Constraints layout• Relative layout• Container• Splash Screen	10	(CLO2)
II	What is google firebase and why should you use it?	5	(CLO3)
III	The demand for a cross-platform app development framework has reached a new height. The prime reason behind this increased demand is that cross-platform apps have a wider reach as compared to native apps because of which they allow businesses to reach a wide number of people making it a 'one-of-a-kind technology'. One of your friends Altaf needs your suggestion about the best cross-platform so that he can develop an application to raise funds for cholistan. Recommend two best cross-platforms with reasons and which deployment model of cloud will be suitable for him and why? Take any necessary assumptions, if required.	10	(CLO3)
IV	Explain the below-given code functionality a) <pre>LatLng sydney = new LatLng(+31.094441070356532, +74.24806617241); mMap.addMarker(new MarkerOptions().position(sydney).title("Marker in IFT-402")); mMap.moveCamera(CameraUpdateFactory.newLatLng(sydney));</pre> b)	5	(CLO2)

```

public boolean onOptionsItemSelected(MenuItem item) {
    switch (item.getItemId()) {
        case R.id.normal_map:
            mMap.setMapType(GoogleMap.MAP_TYPE_NORMAL);
            return true;
        case R.id.hybrid_map:
            mMap.setMapType(GoogleMap.MAP_TYPE_HYBRID);
            return true;
        case R.id.satellite_map:
            mMap.setMapType(GoogleMap.MAP_TYPE_SATELLITE);
            return true;
        case R.id.terrain_map:
            mMap.setMapType(GoogleMap.MAP_TYPE_TERRAIN);
            return true;
        default:
            return super.onOptionsItemSelected(item);
    }
}

```

V a)	Write the XML part of the below-given figures	8+2	(CLO2)	
b)	<p>Enter the detail</p> <p>name</p> <p>contact</p> <p>DoB</p> <p>INSERT</p> <p>UPDATE</p> <p>DELETE</p> <p>VIEW</p>			

What will be the output of the following program? Give an answer with a reason.

```

public class MyFirst {
    public static void main(String[] args) {
        MyFirst obj = new MyFirst(n);
    }
}

```

```
}

static int a = 10;
static int n;
int b = 5;
int c;
public MyFirst(int m) {
    System.out.println(a + ", " + b + ", " + c + ", " + n + ", "
    " + m);
}

// Instance Block
{
    b = 30;
    n = 20;
}

// Static Block
static
{
    a = 60;
}
```

20 , 20

😊 Wish you all the best 😊



Department of Computer Science (New Campus)
University of Engineering & Technology, Lahore

Subject: Introduction to Data Science
(6th Semester, 2019 Session, Sec-A)

Student's Name: Daud Ahmad Reg. Number: 2019-CS-620

QUIZ # 1

Total Marks: 10

Time Allowed: 20 Minutes

CLO-1	Question # 1	Marks																						
	<p>A store manager believes that there is a linear relationship between the income from sales of goods (Y) and the amount spent on advertising (X), both in thousands of dollars.</p> <table border="1"> <thead> <tr> <th>Advertising spending</th><th>Income from sales</th></tr> </thead> <tbody> <tr><td>5.3</td><td>21</td></tr> <tr><td>3.8</td><td>16</td></tr> <tr><td>3.1</td><td>13</td></tr> <tr><td>2.9</td><td>12</td></tr> <tr><td>4.4</td><td>23</td></tr> <tr><td>4.9</td><td>20</td></tr> <tr><td>5.1</td><td>23</td></tr> <tr><td>5.4</td><td>24</td></tr> <tr><td>3.2</td><td>14</td></tr> <tr><td>5.1</td><td>19</td></tr> </tbody> </table> <p>Please note:</p> $\sum x = 43.2$ $\sum x^2 = 195.34$ $\sum y = 185$ $\sum y^2 = 3601$ $\sum xy = 835$ $\frac{n}{\bar{x}} = \frac{10}{18.5}$ <p>Given the equation of Linear Regression is</p> $\hat{y}_i = b_0 + b_1 x_i$ <p>a) Calculate the linear regression coefficients b_0 and b_1 for this data. b) Comment on the 'goodness-of-fit' of the regression line. c) Estimate the income from sales if an amount of 4.5 (in thousand dollars) is spent. d) Calculate the Root Mean Square Error for this data.</p>	Advertising spending	Income from sales	5.3	21	3.8	16	3.1	13	2.9	12	4.4	23	4.9	20	5.1	23	5.4	24	3.2	14	5.1	19	2 3 2 3
Advertising spending	Income from sales																							
5.3	21																							
3.8	16																							
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4.4	23																							
4.9	20																							
5.1	23																							
5.4	24																							
3.2	14																							
5.1	19																							

Considering,

$$\hat{y} = a + bx$$

$$a = \frac{\sum x - b \sum y}{n}, \quad b = \frac{n \sum (xy) - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

$$b = \frac{10(835) - (43.2)(185)}{10(195.34) - (43.2)^2} = \frac{8350 - 7992}{1953.4 - 1866.24}$$

$$b = \frac{358}{87.16} = 4.1074$$

$$a = \frac{43.2 - (4.1074)(185)}{10} = -716.669$$

$$a = -716.669$$

Here, $b_0 = -716.669$ and $b_1 = 4.1074$

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

$$= \frac{10(835) - (43.2)(185)}{\sqrt{[(10)(195.34) - (43.2)^2][10(3601) - (185)^2]}} =$$

x	y	\hat{y}	$y - \hat{y}$	$y - \bar{y}$
5.3	91	-49.897	70.897	2.5
3.8	16	-56.058	72.058	-2.5
3.1	13	-58.934	71.934	-5.5
2.9	12	-59.75544	71.755	-6.5
4.4	23	-53.594	76.594	4.5
4.9	20	-51.541	71.541	1.5
5.1	23	-50.719	73.719	-6.5
5.4	24	-49.487	73.487	5.5
3.2	14	-58.523	72.523	-4.5
5.1	19	-50.710	69.710	0.5
Σ			724.218	-11.0

2

$$R^2 = 1 - \frac{\sum (y - \hat{y})^2}{\sum (y - \bar{y})^2} = 1 - \frac{724.218}{-11.0} = 1 + 65.838$$

$$R^2 = \underline{66.838}$$



Department of Computer Science (New Campus)
University of Engineering & Technology, Lahore

Subject: Introduction to Data Science

(6th Semester, 2019 Session)

Student's Name: Daud Ahmad

Mid Term

Total Marks: 30

Time Allowed: 75 Minutes

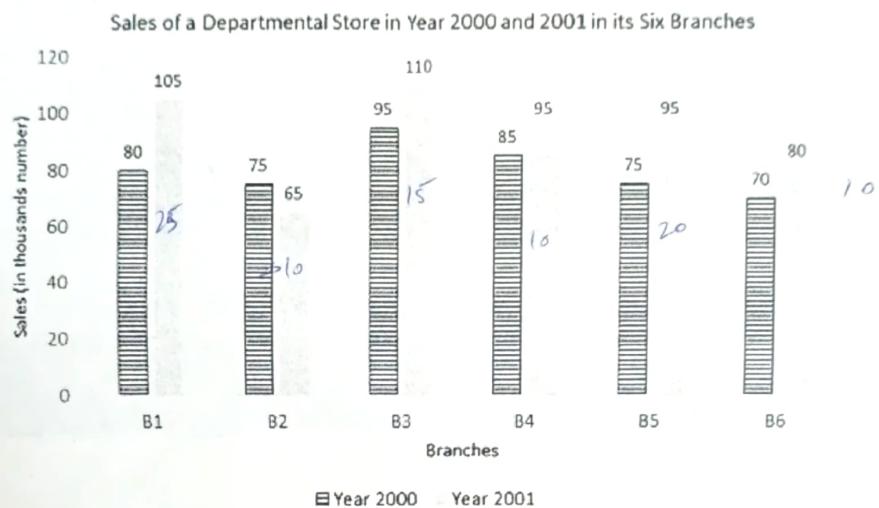
Reg. Number: 2019-CS-620

CLO-2

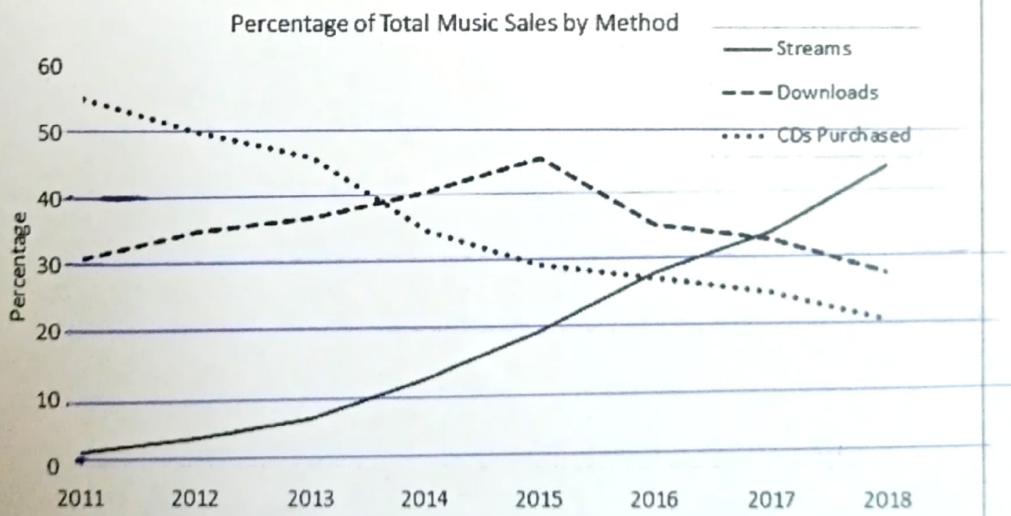
Question # 1

Describe the plots in Figure 1 and 2 below. Figure 1 shows the data of a departmental store where Figure 2 shows the data of music sale in a city.

5 + 5
Marks



(Figure 1)



(Figure 2)

CLO-1	<p>Question # 2</p> <p>a) A class scored 96, 20, 20, 45, 40, 32, 97, 100, 98, 45, 90, 35 and 91 in an exam. Comment on the skewness of this dataset.</p> <p>b) A student achieved 46, 69, 32, 60, 52, 41 marks in 6 subjects. Find the standard deviation of his marks.</p> <p>c) Two four-sided dice numbered 1, 2, 3, 4 were rolled and their faces were added to create a dataset of discrete random variable X as shown below. Find the probability distribution of X and draw its plot.</p> <table border="1"> <thead> <tr> <th>+</th><th>1</th><th>2</th><th>3</th><th>4</th></tr> </thead> <tbody> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr> <td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr> <td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr> <td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> </tbody> </table>	+	1	2	3	4	1	2	3	4	5	2	3	4	5	6	3	4	5	6	7	4	5	6	7	8	3+3+4 Marks
+	1	2	3	4																							
1	2	3	4	5																							
2	3	4	5	6																							
3	4	5	6	7																							
4	5	6	7	8																							
CLO-1	<p>Question # 3</p> <p>a) Describe the difference between Univariate, Bivariate and Multivariate data analysis? What type of plots are used to present the results of these analysis?</p> <p>b) Differentiate between descriptive and inferential statistics. What are different measures of central tendency, and dispersion in descriptive statistics?</p>	5 + 5 Marks																									



Department of Computer Science (New Campus) University of Engineering & Technology, Lahore

Subject: **Introduction to Data Science**
(6th Semester, 2019 Session)

Student's Name: _____

Final Term

Total Marks: 40

Time Allowed: 120 Minutes

Reg. Number: _____

CLO-3	Question # 1	5 + 5 Marks																																												
	<p>The data of a student shows that his mood is highly influenced by three factors: the Weather (W), his Result (R) and whether he has his favorite Food (F) to eat or not. The table below shows this data</p> <table border="1"><thead><tr><th>Weather (W)</th><th>Result (R)</th><th>Food (F)</th><th>Mood (M)</th></tr></thead><tbody><tr><td>Bad</td><td>Fail</td><td>Yes</td><td>Angry</td></tr><tr><td>Good</td><td>Fail</td><td>No</td><td>Angry</td></tr><tr><td>Good</td><td>Fail</td><td>No</td><td>Angry</td></tr><tr><td>Good</td><td>Fail</td><td>No</td><td>Angry</td></tr><tr><td>Bad</td><td>Pass</td><td>Yes</td><td>Angry</td></tr><tr><td>Bad</td><td>Pass</td><td>Yes</td><td>Happy</td></tr><tr><td>Bad</td><td>Pass</td><td>Yes</td><td>Happy</td></tr><tr><td>Good</td><td>Pass</td><td>No</td><td>Happy</td></tr></tbody></table>		Weather (W)	Result (R)	Food (F)	Mood (M)	Bad	Fail	Yes	Angry	Good	Fail	No	Angry	Good	Fail	No	Angry	Good	Fail	No	Angry	Bad	Pass	Yes	Angry	Bad	Pass	Yes	Happy	Bad	Pass	Yes	Happy	Good	Pass	No	Happy								
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	<ol style="list-style-type: none">On a new day when W = Good, R = Pass, and F = Yes, how would you predict his mood using Naïve Bayes classifier? Show all the calculations.On another day when W = Bad, R = Fail, and F = No, how would you predict his mood using Naïve Bayes classifier? Show all the calculations.																																													
CLO-3	Question # 2	5 + 5 Marks																																												
	<ol style="list-style-type: none">The output of a machine learning classifier is given below in the form of actual and predicted data. Draw the Confusion Matrix of this classifier and calculate its <u>accuracy</u>.The output of a machine learning classifier is given below in the form of actual and predicted data. Draw the Confusion Matrix of this classifier and calculate the <u>precision</u> for each class.																																													
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Actual	Dog	Dog	Cat	Dog	Cat	Cat	Cat	Dog	Dog	Cat																																				
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Predicted	Cat	Cat	Cat	Cat	Dog	Dog	Cat	Dog	Bird	Cat																																				

CLO-3

Question # 3

- a) A random sample of 400 people were surveyed, and each person was asked to report the highest education level s/he has obtained. The data that resulted from the survey is summarized in the table below:

5+5
Marks

	Matriculation	Bachelors	Masters	Ph. D.	Total
Female	60	54	48	42	204
Male	40	45	54	57	196
Total	100	99	102	99	400

The NULL hypothesis states that the education level and gender are independent.
Apply Chi-Square test to accept or reject this NULL hypothesis.

✓ **Note:** The critical value of Chi-Square with 3 degree of freedom at 5% level of significance is **7.815**

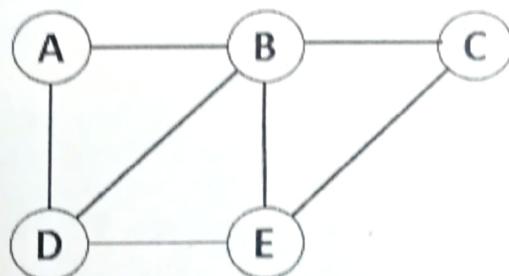
- b) Given the three documents below, calculate the cosine similarity between them to find which two documents are more similar?

D1	We ate pizza at home.
D2	We ate pizza at cafeteria.
D3	We ate pizza together.

CLO-2

Question # 4

- a) Describe different centrality measures used in social network analysis to find the importance of a node in a graph.
- b) Find the average clustering coefficient of the graph in Figure 1.

**Figure 1**



Department of Computer Science, New Campus
**UNIVERSITY OF ENGINEERING
AND TECHNOLOGY, LAHORE**



Roll: 2019-CS-620

MIDTERM (FALL 2021)

Programming Languages

Time: 60 minutes

Marks: 45

Question 1:

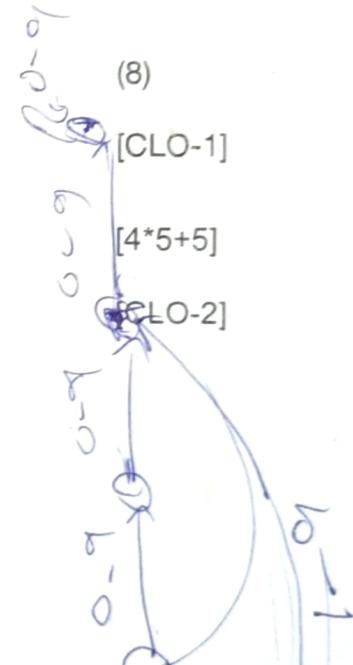
(3+3+3+3)

Short Questions:

- i) Write variable name rules for high level programming languages ? [CLO-1]
- ii) Define Language. Differentiate between word and invalid string ? [CLO-1]
- iii) Programming languages rules defined by what methodology? [CLO-2]]
- iv) One instruction in programming languages composed of multiple rules. Justify it with example [CLO-2]

Question 2:

Design DFA of all string starting with 000 or ending with 00

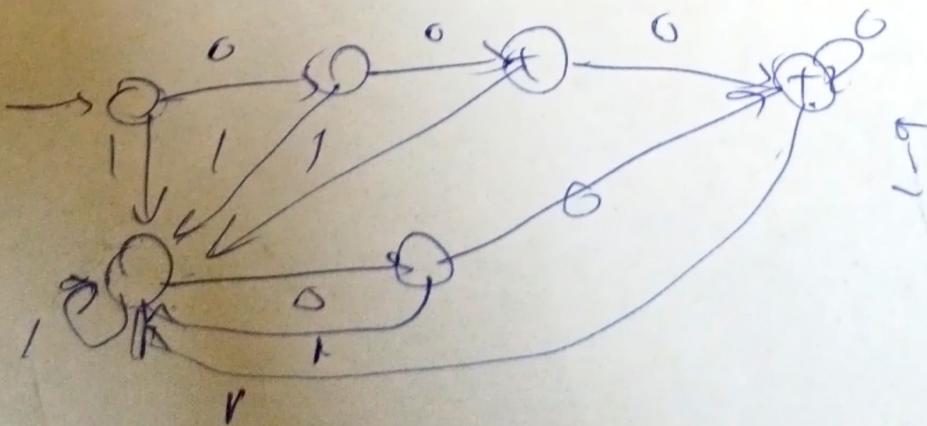


Question 3:

Design a Programming Language comprised of given rules.

- A) Alphanumeric Identifier starting or ending with A or B.
- B) Floating numbers greater than 20
- C) Numbers greater than 310
- D) Operators {+, -, ==, =, /, *, ++, +, -}
- E) Space. {tab}

Write any two instruction of this language.





Department of Computer Science, New Campus
**UNIVERSITY OF ENGINEERING
AND TECHNOLOGY, LAHORE**



MARKS: 50

FINAL TERM - PL

TIME: 1 hour 30 minutes

Question 1: Short Questions

6*4 marks

- i) Describe briefly the process of designing a custom programming language. [CLO-3]
- ii) Design parse tree for given expression which returns and assign 21 to n. [CLO-3]
 $n = m^*(5-2)$ $m = 7$
- iii) Differentiate between scripting and high level languages. State two examples also. [CLO-4]
- iv) How do frameworks effect processing time of high level language. [CLO-4]
- v) Differentiate between interpretation and translation.
- vi) On what parameters two different High level languages get compared ?

Question 2:

Computer Science Department is designing two softwares named learning management system and staff management system. Department needs staff management system at earliest with interactive UI for attendance, monitoring and management of staff. Learning management is a system which will be being consumed by thousands of students and everyone will looking for their respective data quickly. Which language/framework you will be choosing to develop each of the systems. Justify your answers.

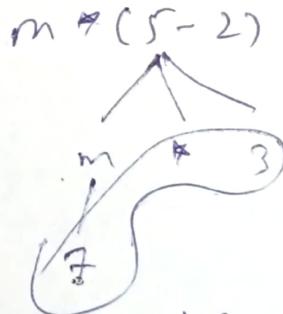
7 marks. [CLO-3]

Question 3:

A language L1 consisting of identifiers and numbers and operators wants to provide following types of expressions and blocks. Design grammar for them and evaluate/validate any two of such expressions and blocks.

14 marks [CLO-4]

- a) Multiplication
- b) Summation
- c) Subtraction
- d) Division
- e) Precedence with parenthesis
- f) Modulus
- g) Assignment
- h) If and else blocks.
- i) Any valid combination of a to g.

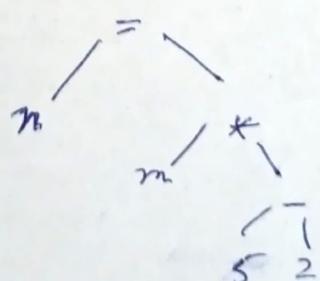
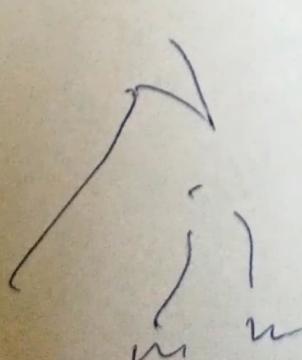


$7 * 3 \Rightarrow 21$ ~ 5 marks [CLO-3]

Question 4:

Design PDA for

$$\{a^{2n}b^{3n} \mid n \geq 0\}$$



aaaabb



University of Engineering and Technology, Lahore (New Campus)
Mid Term Exam (Fall 2021)



Course Title:CS-411 Compiler Construction

Time: 1:30 Hrs

Total Marks: 25

Obtained Marks:

Name: *Daud Ahmed*

Roll Number: *2019-CS-620*

Section: *(A)*

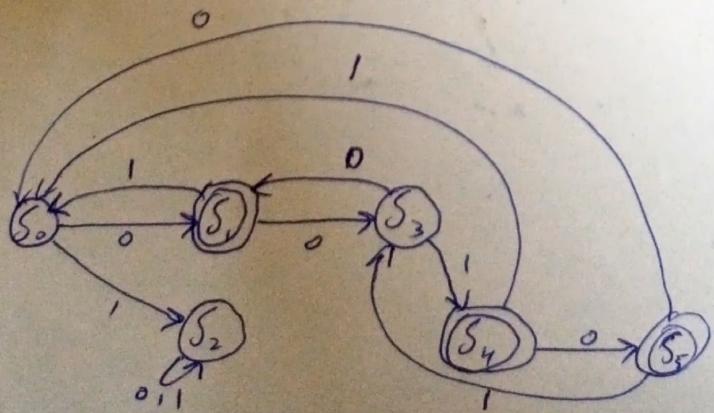
Q No.	Description	CLO	Marks																					
1	a) Write down the phases of single pass compiler. b) What does mean by multi-pass compiler and what are its advantages.	1	4																					
2	Convert the given NFA to DFA by using subset construction method. Show the complete process. $\Sigma = \{a, b\}$.	1	4																					
3	<p>The lexical specification for TINY language is given below. Draw the transition diagram, transition table and tokenize the sample code <lexical unit, lexeme>.</p> <p>$\Sigma = \{a, b, c, \dots, z, 0, 1, +, =, ;, \text{newline}, \text{space}\}$</p> <table border="1"> <thead> <tr> <th>Lexical unit</th><th>Pattern</th><th>Sample code</th></tr> </thead> <tbody> <tr> <td>Identifiers</td><td>Three or more letters</td><td>numa=100;</td></tr> <tr> <td>Keywords</td><td>cout</td><td>var=11 +numb</td></tr> <tr> <td>Numbers</td><td>More than one digits</td><td>cout var;</td></tr> <tr> <td>Operators</td><td>=, +</td><td></td></tr> <tr> <td>Punctuations</td><td>;</td><td></td></tr> <tr> <td>Delimiter</td><td>Space, newline</td><td></td></tr> </tbody> </table>	Lexical unit	Pattern	Sample code	Identifiers	Three or more letters	numa=100;	Keywords	cout	var=11 +numb	Numbers	More than one digits	cout var;	Operators	=, +		Punctuations	;		Delimiter	Space, newline		1	5
Lexical unit	Pattern	Sample code																						
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Numbers	More than one digits	cout var;																						
Operators	=, +																							
Punctuations	;																							
Delimiter	Space, newline																							

4	Remove the ambiguity from the given grammar.	3	4
	$S \rightarrow aAd \mid aB$ $A \rightarrow Ac \mid Aad \mid d$ $B \rightarrow BA \mid a$		
5	Consider the following context free grammar	3	8

$\text{Start} \rightarrow \text{Val}$
 $\text{Val} \rightarrow \text{num} \mid (\text{Expr})$
 $\text{Expr} \rightarrow + \text{Val Val} \mid * \text{Values}$
 $\text{Values} \rightarrow \text{Val Values} \mid \lambda$

- a) Compute the First and Follow Set.
- b) Construct the LL(1) parse table.
- c) Parse the input “* (+ num num)” by using LL(1) parse table.

(+ num num)*





University of Engineering and Technology, Lahore (New Campus)
Final Term Exam (Fall 2021)



Course Title:CS-411 Compiler Construction

Time: 1:30 Hrs

Total Marks: 35

Q No.	Description	CLO	Marks
1	<p>Answer the given questions.</p> <ul style="list-style-type: none"> a. Explain the error recovery techniques with the help of examples. b. What kind of conflicts occurred using shift-reduce parsing explain it with example and how it can be resolved? c. What is difference in LR(0), SLR and LR(1) parse table? d. What is the role of symbol table manager in compiler? 	3	10
2	<p>Write the three address code for the following c++ code.</p> <pre>int fun(int x, int y) { int pow=1; for (int i=; i<=y; i++) { pow=pow*x; } return pow; }</pre>	2	5
3	<p>Optimize the following code.</p> <pre>int main() { int a,b,c,d; a=0; b=1; c=4; int x,y; for (int i=0; i<=c; i++) { d= (i+b) * (i+b) * (i+b) + (c*b); } return 0; }</pre>	2	5
4	<p>Write the context free grammar for the given syntax specification of mini Language. $\Sigma = \{ \text{start}, \text{begin}, \text{end}, \text{num}, [,], \text{show}, (), +, *, =, \text{loop}, <, >, ==, \text{id}, \text{digit} \}$</p>	3	5

Note: Use id to represent variable name and digit to represent value.

Syntax Specification	Example
Program Block	start() begin end
Declaration Statement Only array declaration is allowed of num datatype of given size.	num a[2];
Assignment Statement Only two operators are allowed. Operator that can be used are (+, *, =) (+, *, =)	a[1]=10; a[2]=a[1]*5; a[1]=3+2; a[2]=a[1]*a[2]
Display Statement Single value or multiple values.	show(a[0]); show(a[1],a[2]);
Repetition Structure	loop(boxexp) begin End
bolexp Only compare array values with operators (>, <, ==)	
Sample program of mini language	start() begin num a[2]; loop(a[1] < a[2]) begin show(a[1]); a[1]=a[1]+1; end end

5	Show that the grammar is LR(1). $S \rightarrow Aa \mid bAc \mid Bc \mid bBa$ $A \rightarrow a$ $B \rightarrow b$	3	5
6	Consider a context free grammar of signed fractional binary number used to represent the fraction part of given binary number. $N \rightarrow S \ 0 \cdot \ L$ $S \rightarrow - \mid +$ $L \rightarrow B \ L \mid B$ $B \rightarrow 0 \mid 1$ Define the semantic rule for the attributes to compute the fraction number into decimal value. i.e. given -0.1101 will produce -0.8125	2	5



NOTE: Attempt all the questions on Question paper.

Q. No.	QUESTIONS	MARKS						
1. [CLO1]	<p>i. Write worst case time complexities of following algorithms (7 marks)</p> <p>a. Selection sort n^2 b. Merge sort $\frac{n}{2}n$ c. Quicksort n^2 d. Heapsort $n \log n$ e. Counting sort $n \log n$ f. Radix sort $n \log n$ g. Binary Search $\log n$</p> <p style="text-align: center;">3</p> <p>ii. Which of the following best describes the useful criterion for comparing the efficiency of algorithms? (1 mark)</p> <p>a. Time b. Memory c. Both of the above d. None of the above</p> <p>iii. How is time complexity measured? (1 marks)</p> <p>a. By counting the number of algorithms in an algorithm. b. By counting the number of primitive operations performed by the algorithm on given input size. c. By counting the size of data input to the algorithm. d. None of the above</p> <p>iv. Which of the following sorting algorithm is Stable (1 marks)</p> <p>a. Selection sort b. Heapsort c. Counting d. All of Above</p>	(10)						
2. [CLO2]	<p>v. What is time complexity of the following algorithm? (2 Marks)</p> <table border="1"> <tr> <td> <p>a. $O(N)$ b. $O(N \log N)$ c. $O(N * \text{Sqrt}(N))$ d. $O(N^2)$</p> </td> <td> <pre>int a = 0; for (int i = 0; i < N; i++) { for (j = N; j > i; j--) { a = a + i + j; } }</pre> </td> </tr> </table> <p>vi. What is time complexity of the following algorithm? (2 Marks)</p> <table border="1"> <tr> <td> <p>a. $O(n)$ b. $O(n \log n)$ c. $O(n^2)$ d. $O(n^2 \log n)$</p> </td> <td> <pre>int i, j, k = 0; for (i = 1; i <= n; i++) { for (j = 2; j <= n; j = j * 2) { k = k + n / 2; } }</pre> <p style="margin-left: 100px;">$1 + n + n + \dots + n$ $n + n^2 + \dots + n^2$</p> </td> </tr> </table> <p>vii. What is time complexity of the following algorithm? (2 Marks)</p> <table border="1"> <tr> <td> <p>a. $O(N)$ b. $O(\text{Sqrt}(N))$ c. $O(N / 2)$ d. $O(\log N)$</p> </td> <td> <pre>int a = 0, i = N; while (i > 0) { a += i; i /= 2; }</pre> </td> </tr> </table>	<p>a. $O(N)$ b. $O(N \log N)$ c. $O(N * \text{Sqrt}(N))$ d. $O(N^2)$</p>	<pre>int a = 0; for (int i = 0; i < N; i++) { for (j = N; j > i; j--) { a = a + i + j; } }</pre>	<p>a. $O(n)$ b. $O(n \log n)$ c. $O(n^2)$ d. $O(n^2 \log n)$</p>	<pre>int i, j, k = 0; for (i = 1; i <= n; i++) { for (j = 2; j <= n; j = j * 2) { k = k + n / 2; } }</pre> <p style="margin-left: 100px;">$1 + n + n + \dots + n$ $n + n^2 + \dots + n^2$</p>	<p>a. $O(N)$ b. $O(\text{Sqrt}(N))$ c. $O(N / 2)$ d. $O(\log N)$</p>	<pre>int a = 0, i = N; while (i > 0) { a += i; i /= 2; }</pre>	10
<p>a. $O(N)$ b. $O(N \log N)$ c. $O(N * \text{Sqrt}(N))$ d. $O(N^2)$</p>	<pre>int a = 0; for (int i = 0; i < N; i++) { for (j = N; j > i; j--) { a = a + i + j; } }</pre>							
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viii. What is time complexity of the following algorithm?

(2 Marks)

- a. $O(n)$
- b. $O(k)$
- c. $O(\log_k n)$
- d. $O(\log_n k)$

```
int k=2;  
for(int i=1;i<n;i++)  
    i*=k
```

ix. What is the time and space complexity of following code?

(2 Marks)

- a) $O(n * m)$ time, $O(1)$ space
- b) $O(n + m)$ time, $O(n + m)$ space
- c) $O(n * m)$ time, $O(n + m)$ space
- d) $O(n + m)$ time, $O(1)$ space

```
int a = 0, b = 0;  
for(i = 0; i < N; i++)  
{  
    a = a + rand();  
}  
for(j = 0; j < M; j++)  
{  
    b = b + rand();  
}
```

3.
[CLO3]

x. Given following code snippet

(15 Marks)

25

- a. Analyze each code statement in terms of time complexity
- b. Write Recurrence relation
- c. Solve recurrence relation by Recurrence Tree method

```
int BinSearch( int key, int[] A, int low, int high )  
{  
    int middle;  
    if (low == high)  
    {  
        if(A[low]==key)  
            return low;  
        else  
            return 0;  
    }  
    else  
    {  
        mid=(low+high)/2;  
        if(key==A[mid])  
            return mid;  
        if(key<A[mid])  
            return BinSearch(key, A, low, mid-1);  
        else  
            return BinSearch(key, A, mid+1, high);  
    }  
}
```

xii. Write following recurrence relations in the form of $aT(n/b) + f(n)$ and solve using Master theorem (10 marks)

- a. $T(n) = 2T(n/2) + n$
- b. $T(n) = 2T(n/2) + n \log^2 n$
- c. $T(n) = 2T(n/2) + \frac{n}{\log^2 n}$
- d. $T(n) = 2T(n/2) + n^2$
- e. $T(n) = 4T(n/2) + \frac{n^3}{\log n}$

[CLO4]

xiii. Given following array of unsorted integers;

(15 Marks)

15

- a. Which of sorting algorithm is best suitable to sort these elements?
- b. Give reason/justification
- c. Analyze Time complexity of the selected sorting algorithm

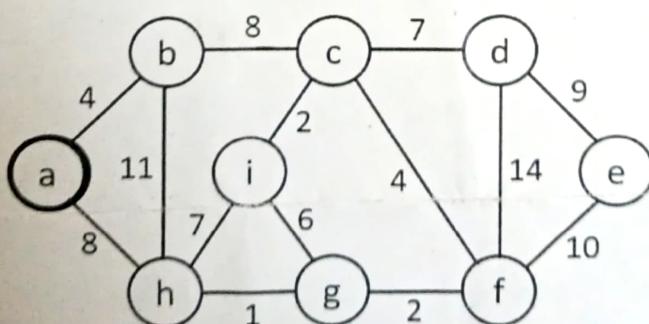
127	324	173	4	38	217	134
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NOTE: Attempt all the questions on Question paper.

Q. No.	Questions	Marks
1	<p>Write time worst case time complexities of the following algorithms</p> <ul style="list-style-type: none"> a. Selection sort $n^2 n^2$ b. Merge sort $n \log_2 n$ c. Quicksort $n \log n$ d. Heapsort n^2 e. Binary Search $\log n$ f. Recursive Implementation of finding Fibonacci Numbers 2^n g. Dynamic programming solution of Fibonacci Numbers n h. Calculating Huffman code $O(n \log n)$ i. Prim's algorithm $O(E \log V)$ j. Dijkstra's Algorithm $O(E \log n)$? $O(E \log E)$ 	10
2	<p>Pick the correct option</p> <ul style="list-style-type: none"> i. Which of the following algorithm is the best approach for solving Huffman codes? <ul style="list-style-type: none"> a. exhaustive search <u>b.</u> greedy algorithm c. brute force algorithm d. divide and conquer algorithm ii. Which algorithm is best to solve problem "given some matrices to multiply, determine the best order to multiply them so you minimize the number of single element multiplications" <ul style="list-style-type: none"> a. Dynamic programming b. Greedy Method c. Divide and conquer d. None of the above iii. Which algorithm is best to solve problem "given a rod of length n and a table of prices p_i for $i = 1, \dots, n$; the goal is to determine the maximum revenue r_n, obtainable by cutting up the rod and selling the pieces" <ul style="list-style-type: none"> a. Dynamic programming b. Greedy Method c. Divide and conquer d. None of the above iv. Shortest path problem can be solved using <ul style="list-style-type: none"> a. Prim's algorithm b. Dijkstra's Algorithm <u>c.</u> Both of the above d. None of above v. How is time complexity measured? <ul style="list-style-type: none"> a. By counting the number of algorithms in an algorithm. <u>b.</u> By counting the number of primitive operations performed by the algorithm on given input size. c. By counting the size of data input to the algorithm. d. None of the above 	5

3	<p>a. Define optimal merge pattern problem with the help of example b. Compute the time complexity of solving optimal merge pattern using greedy approach by doing each statement level time complexity analysis and overall algorithm time complexity. c. Solve the following given scenario with the help of Greedy Algorithm.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>List Name</td><td>L1</td><td>L2</td><td>L3</td><td>L4</td><td>L5</td></tr> <tr> <td>List Length</td><td>15</td><td>5</td><td>10</td><td>20</td><td>25</td></tr> </table>	List Name	L1	L2	L3	L4	L5	List Length	15	5	10	20	25	15
List Name	L1	L2	L3	L4	L5									
List Length	15	5	10	20	25									
4	<p>a. Define Dynamic Programming design technique; explain with the help of example of calculating Fibonacci numbers. b. Write pseudo code of calculating Fibonacci numbers using dynamic programming (DP). c. Write time complexity of calculating Fibonacci numbers using DP by doing each statement level time complexity analysis and overall algorithm time complexity.</p>	15												
5	<p>a. What is matrix chain multiplication problem? b. Which programming approach is used to solve matrix chain multiplication c. Given recursive formula, calculate M and K table of the following matrices</p> <p>$m[i, j] = \min \{ m[i, k] + m[i+k, j] + p_{i-k} * p_k * p_j \}$ if $i < j$, where p is dimension of matrix, $i \leq k < j$</p> <p>A1 be a 30x35 matrix A2 be a 35x15 matrix A3 be a 15x5 matrix A4 be a 5x10 matrix</p>	15												
6	<p>a. Write pseudo code of finding minimum spanning tree using either Prim's or Kruskal's algorithm b. Analyze time complexity of each statement of the algorithm and calculate overall time complexity of the algorithm. c. Calculate MST of the given graph by doing dry run of the selected algorithm, show each iteration explicitly as discussed during class.</p>	15												



Dawd Ahmad, 2019-CS-620



Department of Computer Science (New Campus)
University of Engineering & Technology, Lahore

Subject: Computer Organization (3rd Semester, 2019 Session) Final Term
and Assembly Language

Date: 19-03-2021

Time Allowed: 2 hours

Total Marks: 50

Q. No.	Question	Marks	CLO
1	<p>Explain the following instructions of the assembly language. In each case, give one example of usage.</p> <p>a. MUL b. IMUL c. CBW d. ADC e. SBB f. AAA g. DAS h. MOVS i. CMPSW j. REP</p>	15	3
2	<p>A. What is recursion? Explain your answer by writing a program that recursively sums the integers 1 to n where n is an input parameter passed in ECX.</p> <p>B. Write a program using STACK that finds the last EVEN number in a doubleword array. For example, if the array is {2, 5, 8, 7, 1, 6, 9, 3} the program should return 6.</p>	7	2
3	<p>A. Write a program to count the Vowels (A, E, I, O, U) in a string. Assume that the given string contains uppercase letters only.</p> <p>B. Define a structure Point with two fields X and Y of type doubleword. Declare and initialize two variables of type Point. Now, declare a third point and initialize its X and Y by summing the Xs and Ys of the two points, respectively.</p> <p>C. Write INLINE assembly code to calculate the cube of an integer. The integer value is passed to a C function.</p>	7	3



Department of Computer Science (New Campus)
University of Engineering & Technology, Lahore

Subject: **Computer Organization** (3rd Semester, 2019 Session) Mid Term
and Assembly Language

Date: 24-02-2021

Time Allowed: 90 minutes

Total Marks: 40

Student's Name: Daud Ahmad

Reg. Number:

2019-CS-620

CLOs	Question	Marks
1	1. a) What are the basic components of a computer system? Briefly describe their functionality. b) What are CPU registers? Briefly describe the registers of x86-16 processor.	5+5
1	2. State whether the following statements are true or false? Explain your answer a) An identifier cannot begin with a numeric digit. b) Assembly language directives execute at runtime. c) The RET instruction pops the top of the stack into the instruction pointer. d) An Object file is produced by the Linker. e) JMP is a conditional transfer instruction. f) The LOOP instruction repeats a block of statements a specific number of times. g) Stack Pointer register contains the address of the top element of the stack. h) The TYPE operator returns a value of 4 for doubleword operands. i) The PUSH instruction cannot have an immediate operand. j) A nested procedure call occurs when a called procedure calls another procedure before the first procedure returns.	10
2	3. Write the assembly language programs as instructed below. a) Write a program that calculates the following expression using 16-bit registers: $A = (A + B) - (C + D)$ b) Write a program with a loop and indexed addressing that calculates the sum of all the gaps between successive array elements. The array elements are doublewords, sequenced in increasing order. So, for example, the array {0, 2, 5, 9, 10} has gaps of 2, 3, 4, and 1, whose sum equals 10.	4+6
2	4. Write the assembly language program as instructed below. a) Write a program that finds the max number in an array of ten integers (16-bit). b) Write a procedure to find the factorial of an integer (16-bit) passed to it. In the main procedure, prompt the user to enter the integer. (Hint: Factorial of n is calculated as $n! = n * (n-1) * (n-2) * \dots * 1$)	5+5



EXAMINATION: Mid Term (Fall 2020) Department of computer science

SUBJECT: MA-256 Probability and
statistical processes

Time Limit: 90 mins

Total Marks: 30

NOTE: Attempt all the questions

Q. No.	QUESTIONS	CLOs Mapping /marks																				
1.	<p>a) The area sown in <i>Rabi Crop</i> is as follows: Prepare a Pie-chart.</p> <table border="1"> <tr> <td>Wheat</td> <td>106</td> <td>lakh acres</td> </tr> <tr> <td>Gram</td> <td>30</td> <td>lakh acres</td> </tr> <tr> <td>Barley</td> <td>15</td> <td>lakh acres</td> </tr> <tr> <td>Pulses</td> <td>10</td> <td>lakh acres</td> </tr> <tr> <td>Fodder</td> <td>25</td> <td>lakh acres</td> </tr> <tr> <td>Other crops</td> <td>14</td> <td>lakh acres</td> </tr> </table> <p>b) Calculate the per cent contribution of each crop to the total <i>Rabi</i> crops.</p>	Wheat	106	lakh acres	Gram	30	lakh acres	Barley	15	lakh acres	Pulses	10	lakh acres	Fodder	25	lakh acres	Other crops	14	lakh acres	CLO1 (10)		
Wheat	106	lakh acres																				
Gram	30	lakh acres																				
Barley	15	lakh acres																				
Pulses	10	lakh acres																				
Fodder	25	lakh acres																				
Other crops	14	lakh acres																				
2.	<p>The weight of the 40 male students at a university are given in the following frequency table:</p> <table border="1"> <tr> <td>Weight</td> <td>118-126</td> <td>127-135</td> <td>136-144</td> <td>145-153</td> <td>154-162</td> <td>163-171</td> <td>172-180</td> </tr> <tr> <td>Frequency</td> <td>3</td> <td>5</td> <td>9</td> <td>12</td> <td>5</td> <td>4</td> <td>2</td> </tr> </table> <p>Calculate Median, Mean Deviation, 67th Percentile, 2nd Quartile and Coefficient of Variance.</p>	Weight	118-126	127-135	136-144	145-153	154-162	163-171	172-180	Frequency	3	5	9	12	5	4	2	CLO1 (10)				
Weight	118-126	127-135	136-144	145-153	154-162	163-171	172-180															
Frequency	3	5	9	12	5	4	2															
3.	<p>Calculate b_1 and b_2 from the following data and interpret it according to the findings.</p> <table border="1"> <tr> <td>x</td> <td>10-12</td> <td>12-14</td> <td>14-16</td> <td>16-18</td> <td>18-20</td> <td>20-22</td> <td>22-24</td> <td>24-26</td> <td>26-28</td> </tr> <tr> <td>f</td> <td>3</td> <td>30</td> <td>110</td> <td>218</td> <td>275</td> <td>222</td> <td>108</td> <td>32</td> <td>2</td> </tr> </table>	x	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28	f	3	30	110	218	275	222	108	32	2	CLO1 (10)
x	10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26	26-28													
f	3	30	110	218	275	222	108	32	2													

Quiz

David Ahmad

BSCS Fall 2020

MA-256 Probability and statistical processes

Time: 20 mins

2019-CS-620

Question : Make a stem and leaf table for the following data. Using 8.0 as lower limit of the first class and with the width of 1 unit, convert it to frequency distribution.

9.0	10.2	11.3	12.1	10.7	13.8	10.8
11.6	13.6	16.4	11.0	15.8	9.3	13.7
11.7	11.0	8.0	12.0	11.5	9.7	11.6
10.1	14.1	10.0	9.9	13.4	15.7	11.5
12.3	9.8	13.0	9.1	8.3	12.9	14.0
10.5	13.2	10.5	10.6	12.5	15.1	12.8
10.4	11.2	9.3	11.7	17.7	13.9	16.9
13.4	11.8	16.8	14.2	11.8	9.6	11.9
8.7	14.7	10.9	17.9	11.5	14.7	15.9
11.8	10.6	12.6	12.6	15.7	14.9	9.9



NOTE: Attempt all the questions

Q. no.	QUESTIONS	Marks																				
1.	In a firm, 20 percent of the employees have accounting background, while 5 percent of the employees are executives and have accounting background. If an employee has an accounting background, what is the probability that the employee is an executive?	(10)																				
2.	The incidence of defective items in 200 samples of 6 is shown in the following table:	(10)																				
	<table border="1"> <thead> <tr> <th>No. of defectives per sample</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>Total</th></tr> </thead> <tbody> <tr> <td>No. of samples</td><td>36</td><td>70</td><td>61</td><td>25</td><td>7</td><td>1</td><td>0</td><td>200</td></tr> </tbody> </table> <p>Assuming these results follow a binomial distribution, compute the theoretical binomial probabilities and frequencies.</p>	No. of defectives per sample	0	1	2	3	4	5	6	Total	No. of samples	36	70	61	25	7	1	0	200			
No. of defectives per sample	0	1	2	3	4	5	6	Total														
No. of samples	36	70	61	25	7	1	0	200														
3. a	<p>Assume that the probability of being killed in an accident in a coal mine during a year is $\frac{1}{1400}$.</p> <p>calculate the probability that in the mine employing 350 miners, there will be at least one fatal accident in a year.</p>	(10)																				
3. b	<p>A soft drink machine is regulated so that it discharges an average of 200 milliliters per cup. If the amount of drink is normally distributed with a standard deviation equal to 15 millimeters.</p> <ol style="list-style-type: none"> what fraction of the cups will contain more than 240 milliliters? what is the probability that a cup contains between 191 and 209 milliliters? how many cups will likely overflow if 230 milliliters cups are used for the next 1000 drinks? below what value do we get the smallest 25% of the drinks? 	(10)																				
4.	Find coefficient of correlation and obtain regression line of accident rate on traffic density from the following data	(10)																				
	<table border="1"> <thead> <tr> <th>Traffic Density</th><th>30</th><th>35</th><th>40</th><th>45</th><th>50</th><th>60</th><th>70</th><th>80</th><th>90</th></tr> </thead> <tbody> <tr> <th>Accident Rate</th><td>2</td><td>4</td><td>5</td><td>5</td><td>8</td><td>15</td><td>24</td><td>30</td><td>32</td></tr> </tbody> </table>	Traffic Density	30	35	40	45	50	60	70	80	90	Accident Rate	2	4	5	5	8	15	24	30	32	
Traffic Density	30	35	40	45	50	60	70	80	90													
Accident Rate	2	4	5	5	8	15	24	30	32													
5.	Fit a curve $Y = aX^b$ to the following data:	(10)																				
	<table border="1"> <thead> <tr> <th>X</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr> </thead> <tbody> <tr> <th>Y</th><td>1200</td><td>900</td><td>600</td><td>200</td><td>110</td><td>50</td></tr> </tbody> </table>	X	1	2	3	4	5	6	Y	1200	900	600	200	110	50							
X	1	2	3	4	5	6																
Y	1200	900	600	200	110	50																

Areas under the Unit Normal Curve

<i>z</i>	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0010	0.0080	0.0120	0.0159	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1935	0.1950	0.1985	0.2019	0.2054	0.2083	0.2123	0.2157	0.2190	0.2224
0.6	0.2317	0.2291	0.2324	0.2357	0.2380	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2680	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2810	0.2919	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3418	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3696	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3880
1.2	0.3849	0.3869	0.3888	0.3907	0.3928	0.3944	0.3962	0.3990	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4430	0.4441
1.6	0.4452	0.4463	0.4474	0.4485	0.4495	0.4503	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4758	0.4762	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4810	0.4814	0.4818	0.4824	0.4836	0.4850	0.4854	0.4857
2.2	0.4861	0.4865	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4980	0.4980	0.4981
2.9	0.4981	0.4982	0.4983	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.49865	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.49903	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993

Final Term Examination FALL 2020

Course Title: Technical Writing and Presentation Skills

Course Code: 221

Total Marks: 30

Time allowed: 90 Mins

Answer the following questions. All questions carry equal marks.

- ① Length and scope
- ② formality
- ③ Types (external, internal)
- ④ Purpose (info, analysis, instruct)
- ⑤ Communication (channel)

<p>Q1. What is the purpose of a proposal? Explain the typical components or criteria for proposals.</p>	⑥ Audience CLO3
<p>Q2. Write short answers to the following questions.</p> <ol style="list-style-type: none"> 1) What is a report? List the basic components/criteria of a report. 2) What are purposes of a report? 3) When do you write a progress report? 4) Explain the difference between 'formal' and 'informal' reports. 5) When do you write a lab report? 	CLO3
<p>Q3. What is a research report? Explain the unique aspects of reports in detail.</p>	CLO3

University of Engineering and Technology Lahore, New Campus

Mid Term Examination

Course Title: Technical Writing and Presentation Skills

Course Code: 221

Total Marks: 30

Time allowed: 1 hour &45 mins

Student Name: Daud Ahmad

Registration Number: 2019-CS-620

Answer the following questions. All questions carry equal marks.

Q1. Explain the writing process of technical communication and provides its stages in detail. (10)	CLO1
Q2. Write a Memo calling a meeting. Provide an agenda. (10)	CLO2
Q3. You are the director of a software house. A delegation from Microsoft is visiting your office in the coming week. Write an email to your office manager informing him about the visit of foreign delegation and asking him to do the necessary arrangements. (10)	CLO2



DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF ENGINEERING & TECHNOLOGY, NEW CAMPUS

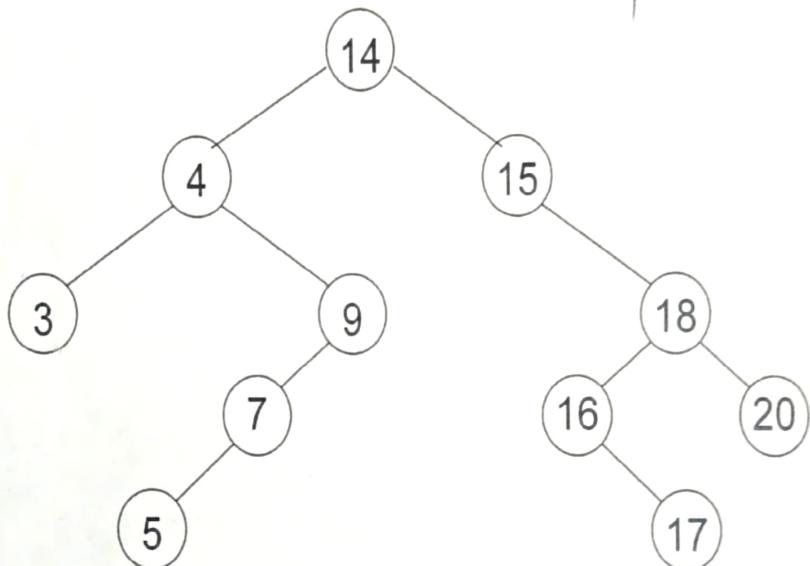
Course Title: Data Structures and Algorithms (Final exam) Time: 1 hour 45 minutes Marks: 50

Student ID: 2019-CS-620

Student Name: Daud Ahmad

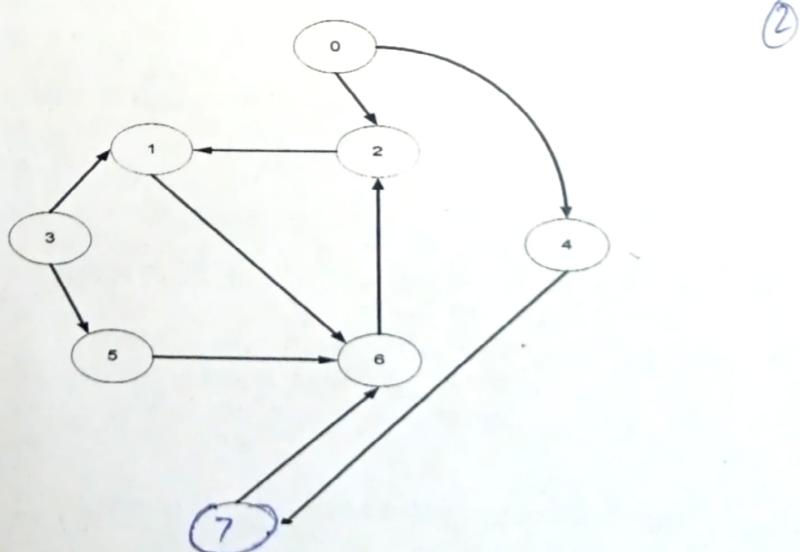
Q No. 1. [CLO4][30 Marks]

- A. Draw what a binary search tree would look like if the following values were added to an initially empty tree in this order 3, 1, 4, 6, 9, 2, 5, 7 [2]
- B. Show the result of deleting the root in the tree of part A [2]
- C. Write a C++ function to find out the minimum value from a BST. [5]
- D. Write preorder and level-order traversal of the tree given below. [1]

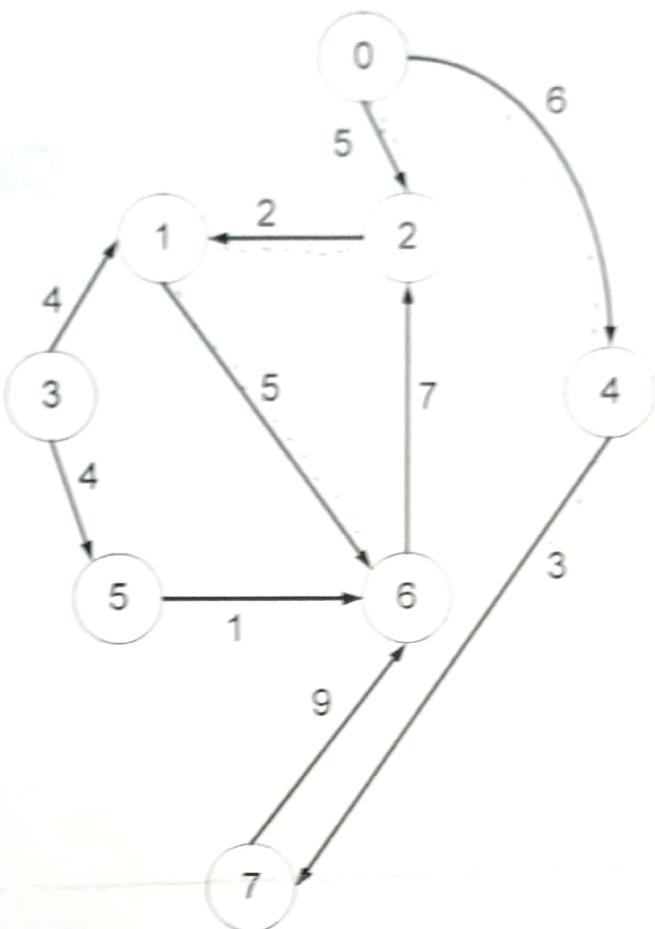


N, L, R

- E. Draw both the adjacency matrix and adjacency list representations of this graph. Be sure to specify which is which. [4]



- F. Step through Dijkstra's Algorithm to calculate the single source shortest path from 0 to every other vertex [5]



- G. Draw the binary min heap that results from inserting: 77, 22, 9, 68, 16, 34, 13, 8 in that order into an initially empty binary min heap. You are only required to show the final heap, although if you draw intermediate heaps, please circle your final result for ANY credit.[4]
- H. Draw the binary min heap that results from doing 2 deletions on the heap you created in part G. You are only required to show the final heap, although if you draw intermediate heaps please circle your final result for ANY credit.[2]
- I. Starting with an empty AVL tree, insert the following keys in order, clearly indicating the final tree: 5, 10, 8, 4, 6, 2 [5]

Q No. 2. [CLO5][20 marks]

- A. Consider inserting data with integer keys 7, 9, 12, 18, 29 in that order into a hash table of size 11 where the hashing function is $h(key)\%11$. [13]
- Show a chaining hash table after doing the insertions
 - Show an open addressing with linear probing hash table after doing the insertions
 - Show an open addressing with quadratic probing hash table after doing the insertions
- B. Implement heap sort function in C++ and analyze its complexity [7]



EXAMINATION:

Quiz 1: 3rd Semester Computer Science Department Fall 2020

SUBJECT:

CS-212L: Data Structures and Algorithms Lab

Time Limit: 120

minutes

Mapping CLOs:

CLO1, CLO2

Total Marks: 15

Marks Obtained.

1.	<p>Write a recursive C++ function to count the number of nodes in the linked list.</p> <p>2. Design, Develop and Implement a Program in C++ for the following Operations on Singly Linked List (SLL) with header nodes (Section A) Operations on Doubly Linked List (DLL) with header nodes (Section A) a. Represent and Evaluate a Polynomial of single variable $p(x) = 6x^3 + 7x^2 + 9x + 9$ b. Find the sum of two polynomials and store the result. Support the program with appropriate functions for each of the above operations</p> <p>Skeleton code:</p> <pre>//set public and private members and you can add/modify the constructors and destructors class term { double coeff; int expo; term* next_term; // for SLL // for DLL term* prev_term; // for DLL term(){} term(double coeff=1, int expo=0) { this->coeff =coeff; this->expo = expo; } }; class polynomial { term* first_term; polynomial(){} polynomial() { first_term=NULL; } polynomial add(polynomial p) // TO DO ; void main{ // using add function p1.add(p2); p3= p1.add(p2); }</pre> <p>Sample Sorting function:</p> <pre>void sort() { int j; term *check_ptr; int count = getCount(); term **arr = new term*[count]; check_ptr = first_term; for(j=0; j<count; j++) { arr[j] = check_ptr; check_ptr = check_ptr->next_term; } }</pre>
----	---

```

        for(int i=0; i<count-1; ++i) {
            for(j=i+1; j<count; ++j) {
                if(arr[i]->expo == arr[j]->expo) {
                    arr[i]->coeff+=arr[j]->coeff;
                    delete arr[j];
                    arr[j] = arr[count-1];
                    --count; } } }
    }

    for(j=1; j<count; j++) {
        check_ptr = arr[j];
        int i = j-1;
        while(i>=0 && arr[i]->expo < check_ptr->expo) {

            arr[i+1] = arr[i];
            i--;
            arr[i+1] = check_ptr; }
        first_term = arr[0];
        for(j=0; j<count-1; j++) {
            arr[j]->next_term= arr[j+1]; }
        arr[j]->next_term=NULL;
        delete [] arr; }

```

Sample Display function:

```

void display()
{
    term *current_term = first_term;
    while(current_term!=NULL)
    {
        if(current_term->coeff>=0)
        {
            cout<<" + "<<current_term->coeff<<"x"^<<current_term-
>expo;
            current_term = current_term->next_term;
        }
        else
        {
            cout<<" - "<<current_term->coeff<<"x"^<<current_term->expo;
            current_term = current_term->next_term;
        }
    }
}

```



University of Engineering & Technology, Lahore
Department of Computer Science (New Campus)

Introduction to Machine Learning
Mid Term Examination – Fall 2022

Max Marks: 45

Time allowed: 70 minutes

Instructions:

1. This is a closed book and closed notes exam.
2. Cheat Sheet is NOT allowed.
3. Please provide answers of all questions on separate answer sheet.

Question 1

20 points

Say you have to train a linear regression mode using following training examples, $m = 4$

x1(area)	X2(bedrooms)	X3(floor)	X4(age)	y(price)
2104	5	1	45	460
1416	3	2	40	232
1534	3	2	30	315
852	2	1	36	178

1. Perform feature normalization. (5)
2. Compute initial value of J (Cost/Error). (5)
3. Perform one iteration of learning and update thetas. (5)
4. Compute J (Cost/Error) again with new updated thetas (did you observe decrease in cost?. if the cost is not decreasing, what corrective action is needed) (5)

Initial values of thetas: $\theta_0 = 0, \theta_1 = 1, \theta_2 = 1, \theta_3 = 1, \theta_4 = 1, \theta_5 = 1$ learning rate is $\alpha = 1$

$$h = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \theta_4 x_4 + \theta_5 x_5$$
$$J(\theta_0, \theta_1, \dots, \theta_n) = \frac{1}{2m} \sum_{i=1}^m (h_\theta(x^{(i)}) - y^{(i)})^2$$
$$\theta_0 := \theta_0 - \alpha \frac{1}{m} \sum_{i=1}^m (h_\theta(x^{(i)}) - y^{(i)})$$
$$\theta_j := \theta_j - \alpha \frac{1}{m} \sum_{i=1}^m (h_\theta(x^{(i)}) - y^{(i)}) x_j^{(i)}$$

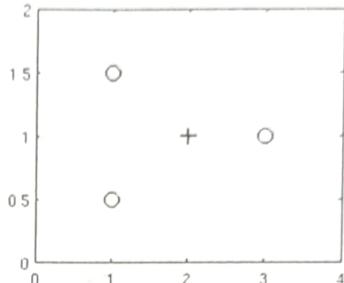
Question 2

15 points

Suppose you have the following training set, and fit a logistic regression classifier.
 $h = \text{sigmoid}(\theta_0 + \theta_1 x_1 + \theta_2 x_2)$, Say, the initial values of Thetas are $\theta_0 = 0$, $\theta_1 = 1$, $\theta_2 = 0$ and learning rate is $\alpha = 1$. The cost function and training set is as under:

$$J(\theta) = -\frac{1}{m} \left[\sum_{i=1}^m y^{(i)} \log h_\theta(x^{(i)}) + (1 - y^{(i)}) \log (1 - h_\theta(x^{(i)})) \right]$$

x_1	x_2	y
1	0.5	0
1	1.5	0
2	1	1
3	1	0



1. Compute initial value of J (Cost/Error). (5)
2. Perform one iteration of learning and update thetas. (5)
3. Compute J (Cost/Error) again with new updated thetas (did you observe decrease in cost?. if the cost is not decreasing, what corrective action is needed) (5)

Question 3

10 points

For logistic regression model $h = \text{sigmoid}(\theta_0 + \theta_1 x_1 + \theta_2 x_2)$ where the cost/error (J) is as under:

$$J(\theta) = -\frac{1}{m} \left[\sum_{i=1}^m y^{(i)} \log h_\theta(x^{(i)}) + (1 - y^{(i)}) \log (1 - h_\theta(x^{(i)})) \right]$$

Compute

1. $\frac{dJ}{d\theta_0}$ (5)
2. $\frac{dJ}{d\theta_1}$ (5)

*****Good Luck*****

University of Engineering and Technology

Department of Computer Science KSK

Machine Learning Final Term Examination – Fall 2022

Max Marks: 50

Time allowed: 110 minutes

Instructions:

1. This is a closed book and closed notes exam.
2. Cheat Sheet is NOT allowed.
3. Please provide answers of all questions on separate answer sheet.
4. Write to the point answers.

Question 1

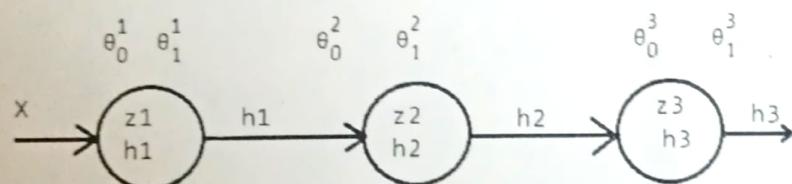
10 points

Write the return for each nonterminal state if you take action to the left direction as indicated by arrows. The discount factor is 0.75

100	0	0	0	0	40
1	2	3	4	5	6

Question 2

10 points



In the figure above, we have very simple neural network containing three neurons in series. Keeping it very simple, assume we have only one training example, with input x and output y .

Derive $\frac{dJ}{d\theta_1^1}$ where

$$J = -y \log(h_3) - (1 - y) \log(1 - h_3), h = \text{Sigmoid}(z) \text{ and } \frac{dh}{dz} = h(1 - h)$$

Question 3:

10 points

You have to cluster the following eight points (with (x, y) representing locations) into three clusters using k-means clustering:

A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9).

Initial cluster centers are: C1(2, 10), C2(5, 8) and C3(1, 2). Perform one iteration only.

Question 4:

10 points

Keeping in mind PCA (principal component analysis) algorithm, you have to reduce X from three dimensions to two dimensions (Z)
 $X = \begin{bmatrix} 2 \\ 2 \\ 2 \end{bmatrix}$

Calculate following

$\Sigma = ?$

Hint: $\Sigma = X^T X$

$U_{\text{reduced}} = ?$

Hint: use U below

$Z = ?$

Hint: $Z = U_{\text{reduced}}^T X$

Percentage of variance retained = ?

Hint: use S below

$[U, S, V] = \text{svd}(\Sigma)$

$$U = \begin{bmatrix} -0.5774 & -0.5774 & -0.5774 \\ -0.5774 & 0.7887 & -0.2113 \\ -0.5774 & -0.2113 & 0.7887 \end{bmatrix}, S = \begin{bmatrix} 12.0000 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Question 5:

10 points

In the table below, we have three features. Calculate the information gain and tell which features deserve to be the root node in the decision tree. (No need to draw the complete decision tree, just decide the root node.)

	Ear shape (x_1)	Face shape (x_2)	Whiskers (x_3)	Cat
	Pointy	Round	Present	1
	Floppy	Not round	Present	1
	Floppy	Round	Absent	0
	Pointy	Not round	Present	0
	Pointy	Round	Present	1
	Pointy	Round	Absent	1
	Floppy	Not round	Absent	0
	Pointy	Round	Absent	1
	Floppy	Round	Absent	0
	Floppy	Round	Absent	0

*****Good Luck*****

Time Allowed: 90 Minutes

Name: Danish Ahmed

Information Security
Midterm Exam

Resource Person: Dr. Sheraz Naseer

Registration ID: 2019-CS-620

SECTION 1:

- 1) Short Questions (CLO1) Each Question Carry One Mark.
- How many bits make up the effective length of the DES key?
 - Apply shift rows operation of AES on given state matrix and write the output.

29	A0	89	24
f3	E2	d5	63
A5	56	47	F9
87	43	11	C6

- What is the Keyspace size of a cipher if the length of cipher key is 12 bits.
- How many Round Keys are required by 128-bit AES Encryption function?
- Write the name of Cipher Operation, which generates ciphertext by rearranging the positions of Plaintext?

SECTION 2: Long Questions. Calculate your ID Mod 4 and solve the appropriate (Only One) part of each Question of this Section.

- 2) (CLO4) Define multiplicative Group Z_n^* . Write the members in multiplicative group Z_n^* for following values of n. Marks: 1+2
- 15
 - 18
 - 9
 - 13
- 3) (CLO3) Calculate (your Last Reg ID Number Mod 4). Apply Affine cipher to decrypt the appropriate word from following: Marks: 4
- Ciphertext = "rzpbuzn" Key = (5, 7)
 - Ciphertext = "yeqmxei" Key = (7, 10)
 - Ciphertext = "yckqtcw" Key = (9, 6)
 - Ciphertext = "zbfvql" Key = (11, 3)

- 4) (CLO1) Calculate the Multiplicative inverse using Fermat's Little Theorem. Marks 4

- 5 Mod 19
- 4 Mod 17
- 13 Mod 19
- 12 Mod 19

- 5) (CLO4) Compare encryption and Decryption diagrams of Block Cipher Mode of Operation (Draw only Diagram of Both Encryption and Decryption) Marks: 4
- Cipher Block Chaining
 - Output Feedback Mode
 - Cipher FeedBack Mode
 - Counter Mode

SECTION 3:

- 6) (CLO3) As a Cipher Analyst You have received a Ciphertext $\begin{matrix} I \\ S \end{matrix}$ encrypted using Hill Cipher. The reports suggest that the cipher key is $\begin{bmatrix} 3 & 5 \\ 2 & 3 \end{bmatrix}$. Apply the information to Decrypt the Ciphertext and show all the calculations where: $X = Y \cdot K^{-1} \text{ Mod } 26$ Marks: 6

- 7) Compare four differences in DES and AES (CLO4) Marks: 2

- 8) Draw the Round function of AES Decryption function (CLO1) Marks: 2