International Islamic University Chittagong
Center for General Education (CGED)
Semester End Examination, Autumn–2022

Course Code: URED-1201   Course Title: Basic Principles of Islam (`Aqidah+`Ibadah)

Full Marks: 50   **Time: 2:30 Hours**

Answer all questions strictly
(All questions are of equal value)

#	Questions	Marks	CLOs	Bloom's taxonomy domain
1. a.	*"And I did not create the Jinn and mankind except to worship Me"*- explain this Ayah mentioning some objectives and conditions of `Ibadah briefly.	10	4	Create
	Or,			
b.	Who are *'Ibadur Rahman* (Allah's slaves)? Summarize their characteristics according to *Surah Al-Muminun* and *Surah Al-Furqan*.			Remember & Create
2.	*"Salah is the first question in the Grave and on the Day of Judgment"*- evaluate this statement summarizing the importance of *Salah* in human life.	10	5	Evaluate
3. a.	Point out the wealth on which *Zakah* is obligatory explaining the due recipients of *Zakah* according to *Islamic Shari`ah*.	10	5	Remember & Create
	Or,			
b.	Evaluate the existing picture of the distribution of *Zakah* in your society. Appraise the role of *Zakah* in poverty alleviation from society.			Analyze
4.	Explain the importance of Sawm summarizing some invalidators of Sawm from the viewpoint of Islam.	10	5	Remember & Create
5.	Point out some essential works of *Hajj*. Analyze some important significance and impact of *Hajj* for the unity of Muslim *Ummah*.	10	5	Analyze

Time: 2:00 Hours   **Full Marks: 50**

Answer any five (05) of the following questions: **5×10 = 50**

1. Write the meaning of following Surahs (any two)   **5+5 = 10**

   a) Surah Al- Feel (سورة الفيل)

   b) Surah Al – Humazah (سورة الهمزة)

   c) Surah At – Takathur (سورة التكاثر)

2. Explain the importance of Tajweedul Qur'an in human life   **10**

3. What are the times of the five daily prayers ?   **10**

4. Write down the system of two rakaat obligatory Fazar prayers   **10**

5. What is the impact of Salah on human life? Explain it   **10**

6. Write down the meaning of Darood Al Ibraheem properly   **10**

7. What is the main theme of Sura Al - Asr?   **10**

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE
Final Exam, Autumn-2022

Course Code: **EEE-1221**

Time: 2 hours 30 minutes

Course Title: **Electronics**

Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) <u>Course Outcomes</u> and <u>Bloom's Levels</u> are mentioned in additional Columns

Course Outcomes (COs) of the Questions	
CO1	Describe the fundamentals of solid state electronics
CO2	Sketch the output wave-shape of different diode circuits
CO3	Differentiate the types of generated and filtered wave-shapes
CO4	Understand the basics of transistor and switching circuits
CO5	Analyze different operational amplifier circuits and their applications

Bloom's Levels of the Questions						
Letter Symbols	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Part A
[Answer the questions from the followings]

1. a) What is JFET? Draw the symbol of N-Channel JFET and P-Channel JFET. Describe the working principle of (N-Channel JFET), When gate-source voltage (V_{GS}) is applied and drain-source voltage is zero i.e. $V_{DS}= 0V$.   CO4   U   5

OR,

With proper diagrams, describe the construction and working principle of an n-channel enhancement-type MOSFET.

1. b) Sketch the transfer and drain characteristics of n-channel enhancement type of MOSFET if $V_T=4V$ and $k=0.5 \times 10^3$ A/V².   CO4   A   5

2. a) Describe the switching action of the transistor by showing the 'OFF' region, 'ON' region, and 'Active' regions on its output characteristics.   CO4   U   5

OR,

Suppose you have given two transistors with few other passive elements, design a Multivibrator having one stable state. Explain its operation when a square wave will generate as Output.

2. b) Determine the minimum high input voltage (+V) required to saturate the transistor switch shown in Fig.2 (b).   CO4   A   5
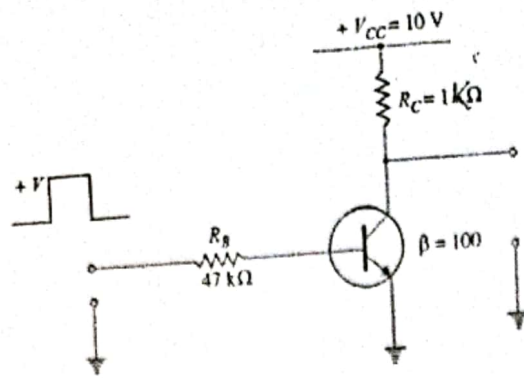
$+V_{cc} = 10\ V$

$R_C = 1\ k\Omega$

$+V$

R_B
$47\ k\Omega$

$\beta = 100$

Fig. 2(b)

Part B

[Answer the questions from the followings]

3. a)	What is an operational amplifier (OP-amp)? Draw the schematic symbol of an operational amplifier indicating the various terminals.	CO5	R	3
3. b)	Show the voltage gain of an inverting op-amp is equal to $-R_f/R_{in}$.	CO5	U	5
3. c)	If $R_f = 68\times10^3\ \Omega$, calculate the value of the output voltage of the following circuit:	CO5	A	2

R_1

$V_1 = +0.2\ V$ — 33 kΩ
$V_2 = -0.5\ V$ — 22 kΩ
$V_3 = +0.8\ V$ — 12 kΩ

$-V_o$
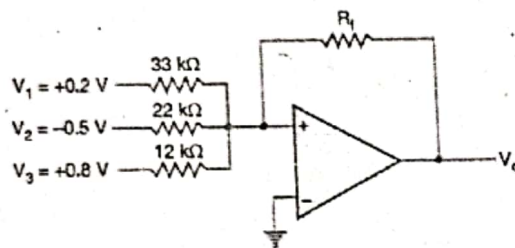
4. a)	Describe the principle of a negative feedback amplifier and hence derive an expression for its gain.	CO5	U	6

OR

Show that output is the differentiation of the input with an inversion and scale multiplier of RC.

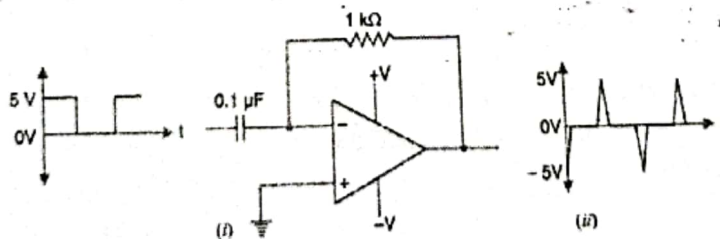|				
4. b)	Fig. 4(b) shows the square wave input to a differentiator circuit. Find the output voltage if input goes from 0V to 5V in 0.1 ms.	CO5	A	4

1 kΩ

5 V
0V

0.1 μF

+V

5V
0V
-5V

(i)

-V

(ii)

Fig.4(b)

5. a)	What is an oscillator? With the help of a neat diagram, describe the circuit operation of a Hartley oscillator.	CO5	U	5

OR

Show that for an op-amp with unity gain, the output voltage is the algebraic sum of the input voltages.

5. b)	Write short on (i) Comparators and (ii) Precision rectifiers.	CO5	U	5

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Final Exam, Autumn-2022

Course Code: **PHY 1201**   Course Title: **Physics-II**

Time: 2 hours 30 minutes

Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) <u>Course Outcomes</u> and <u>Bloom's Levels</u> are mentioned in additional Columns

Course Outcomes (COs) of the Questions	
CO1	**Understand** the basic knowledge of different areas of physics like electromagnetism, structure of matter and modern physics as well as engineering aspect.
CO2	**Apply** mathematical knowledge to formulate and solve engineering problems.

Bloom's Levels of the Questions						
Letter Symbols	**R**	**U**	**App**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Part A
[Answer the questions from the followings]

1.	a)	Define: i) Crystalline solid ii) Crystal	CO1	R	2
1.	b)	What is a packing fraction? With proper illustration, calculate packing fraction for a FCC crystal structure.	CO1	U	5

OR

Define coordination number. Explain coordination number for NaCl structure.

1.	c)	The lattice constants of a simple lattice is a. Find the lattice spacings between (111), (112) and (113) lattice planes.	CO2	A	3
2.	a)	Define Miller indices and draw the plane of (001), (110), (011) and (111).	CO1	U	5
2.	b)	Show that in a crystal of cubic structure, the distance between the planes with Miller indices h, k, l is equal to $d = \dfrac{a}{\sqrt{h^2+k^2+l^2}}$, where a is the lattice parameter.	CO2	A	5

OR,

2   b)   Distinguish between metal, insulator and semiconductor in terms of enregy band theory.

Part B
[Answer the questions from the followings]

			CO1	R	2

3. a) What are the postulates of the special theory of relativity?   CO1   R   2

3. b) Deduce Einstein's mass-energy equation, and mention its significance.   CO1   U   5

OR

Explain the following quotation "A moving clock always appears to go slow".

3. b) Calculate the mass of the electron when it is moving with a K.E. of 10MeV.   CO2   A   3

4. a) Calculate the following properties of $_{28}Ni^{64}$ particle: CO2   A   5
   i. Nuclear Mass
   ii. Nuclear Size
   iii. Nuclear Density
   iv. Nuclear Mass defect
   v. Nuclear Binding Energy

OR,

How to calculate the radius on a Helium atom, using Bohr atomic model?

4. b) Draw the nuclear binding energy curve.   CO1   R   2

4. c) Complete the following decay series: CO1   U   3

$$_{92}^{235}U \xrightarrow{\alpha} V \xrightarrow{\beta} W \xrightarrow{\alpha} X \xrightarrow{\alpha} Y \xrightarrow{\beta} Z$$
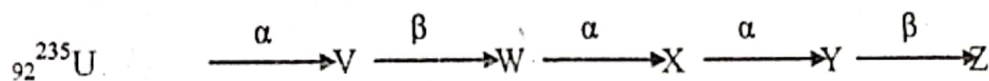
Write down the values of VWXYZ in the above series.

5. a) What do you mean by half-life of a radioactive substance? Hence obtain an expression for the half-life.   CO1   U   5

OR,

State and explain Radio-active decay laws.

5. b) The half life of a radioactive substance is 30 days. Calculate   CO2   A   5
   (i) The radioactive decay constant
   (ii) The mean life
   (iii) The time taken for ¾ of the original number of atoms to disintegrate
   (iv) The time for 1/8 of the original number of atoms to remain unchanged.

Program: B. Sc. in CSE
Course Code: MATH-1207
Time: 2:30 hours

Semester: Autumn-2022
Course Title: Mathematics-II
Total Marks: 50

(i)	Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii)	Please answer the several parts of a question sequentially.
(iii)	Separate answer script must be used for separate group.
(iv)	Course Learning Outcomes (CLOs) and Bloom's Levels are mentioned in additional Columns.

Course Learning Outcomes (CLOs) of the Questions

CLO2:	Solve differential equations using various methods.
CLO3:	Formulate the mathematical model and interpret the results by analyzing the real-world problems related to Growth and Decay Problems, Temperature Problems, Falling Body Problems, Dilution Problems, Electrical Circuits problems etc. through a set of differential equations.

Bloom's Taxonomy Domain Levels of the Questions

Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group – A

			Marks	CLO	DL
1.	a)	Define order and degree of differential equations with example. Form the differential equation, whose solution is given by $xy = pe^x + qe^{-x}$.	5	CLO2	R&U
	b)	Define homogeneous differential equation with example. Solve the differential equation $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$.	5	CLO2	R&U
	Or)	Define linear differential equation. Solve the linear differential equation, $x\frac{dy}{dx} + 2y = x^2 \log x$	5	CLO2	R&U
2.	a)	Define Bernoulli's differential equation. Solve the Bernoulli's differential equation, $\frac{dy}{dx} + xy = x^3 y^3$	5	CLO2	R&U
	b)	Write down the working rules for solving exact differential equation. Solve the differential equation $(x - 2e^y)dy + (y + x\sin x)dx = 0$	5	CLO2	U
	Or)	Solve the differential equation $\frac{d^3 y}{dx^3} - 3\frac{d^2 y}{dx^2} + 4\frac{dy}{dx} - 2y = e^{-x} - \sin 2x$.	5	CLO2	U

	Marks	CLO	DL
	5	CLO2	R&U

3. a) Define Bessel's equation.

Using Bessel's function prove that, $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\sin x$

Or) Define Legendre's equation Using the Rodrigue's formula evaluate the values of $P_2(x)$ 5   CLO2   R&U

b) Apply the method of Variation of Parameters to solve the differential equation $(D^2 + 4)y = 4\tan 2x$.   5   CLO2   U

Or) Solve the differential equation $(D^2 - 2D + 3)y = x^3 + \sin x$ by using the method of Undetermined Coefficients.   5   CLO2   U

4. a) Use the Lagrange's method to solve the partial differential equation $(z^2 - 2yz - y^2)p + (xy + xz)q = xy - xz$.   5   CLO2   R&U

b) Solve the non-linear partial differential equations by Charpit's method, $px + qy = pq$ 5   CLO2   U

5. a) The body of a murder victim was discovered at 11:00 pm. The doctor took the temperature of the body at 11:30 p.m. which was 94.6° F. He again took temperature after one hour when showed 93.4° F and noticed that the temperature of the room was 70° F. Estimate the time of death. [Normal temperature of human body is 98.6° F]   5   CLO3   Ap

b) A generator having emf 100V is connected in series with a 10Ω resistor and an inductor of 2H. If the switch k is closed at time $t = 0$, Obtain a differential equation for the current and determine the current at time t.   5   CLO3   Ap

International Islamic University Chittagong
Department of Computer Science & Engineering
B. Sc. in CSE Semester Final Examination, Autumn-2022

Course Code: CSE-1221   Course Title: Computer programming-II

Total marks: 50   Time: 2 hours 30 minutes

[Answer *all* the following questions. Figures in the right hand margin indicate full marks.
Use a Separate answer script for Group-A and Group-B.]

Course Outcomes (COs) of the Questions		CO	DL
CO1	Identify basic input/output system		
CO2	Illustrate the basic features of OOP such as polymorphism, inheritance etc.		
CO3	Demonstrate familiarity with the use of Class library of a standard OOP language		

Letter Symbols	Bloom's Levels of the Questions					
	R	U	A	N	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group-A

1. a) Define *operator overloading*. Why is it necessary to overload an operator?   2   CO2   R

   b) What is the difference between *operator functions* and normal functions? Explain with a program example.   3   CO2   U

   OR,

   Write a program using the following statement properly with a C++ program:

   Ob2 = 20 + Ob1

   c) Overload the (-) operator to subtract the coordinate of two points using the *friend function*.   3   CO3   A

   d) Write the output of the following code with explanation-   2   CO2   U

```cpp
#include<iostream>
using namespace std;
class CSE{
    int a, b;
public:
    operator + (CSE ob){
        CSE temp;
        temp.a = a + i;
        temp.b = b + i;
        return temp;
    }
};
void main(){
    A ob1, ob2, ob3;
    ob1.a = 10; ob1.b = 12;
    ob2.a = 10; ob2.b = 12;
    ob3 = ob1 + ob2;
    cout >> ob3.a >> ob3.b >> endl
}
```

2. a) "*Protected* members are accessible in the class that defines them and in classes that inherit from that class." – Explain with a simple program example.

b) What problem associates with *multiple inheritance* and how is it solved by virtual inheritance? Explain with example.

c) What does the following program display? Explain.

```cpp
Class B1{
public:
    B1() { cout <<"Constructing B1"; }
    ~B1() { cout <<"Destructing B1\n"; }
};
class B2
{
    int b;
public:
    B2() { cout <<"Constructing B2"; }
    ~B2() { cout <<"Destructing B2\n"; }
};
class D: public B1, public B2
{
public:
    D() { cout <<"Constructing D"; }
    ~D() { cout <<"Destructing D\n"; }
};
int main()
{
    D ob;
    return 0;
}
```

OR

Write the output for the following code with an explanation-

```cpp
class P
{
public:
    void print() { cout <<" Inside P"; }
};
class Q : public P
{
public:
    void print() { cout <<" Inside Q"; }
};
class R: public Q { };
int main(void)
{
    R r;
    r.print();
    return 0;
}
```

Make a class named **Fruit** with a data member to calculate the number of fruits in a   3   CO3   A
basket. Create two other class named **Apples** and **Mangoes** to calculate the number of
apples and mangoes in the basket. Print the number of fruits of each type and the total
number of fruits in the basket.

Group-B

3.a) What is *virtual function*? Why do we need virtual functions?   2   CO2   U

b) What are the reasons to use *pure virtual functions*? Write a program by using pure   4   CO2   A
virtual function.

c) What do you mean by *polymorphism* in OOP? Write the difference between early   4   CO2   U
binding and late binding. Give examples of static and dynamic polymorphism.

4.a) What is an *exception*? What are the advantages of using exception handling   3   CO2   U
mechanism in a program?

OR

Show the general form of *try*, *catch* and *throw* for exception handling. In your own
words describe their *operations*.

b) What is *STL*? Define a *container*, an *iterator*, and an *algorithm* with examples.   3   CO2   U

c) Write a program to insert 20 items in a STL vector, after that sort first N elements of   4   CO3   A
that vector where N is an integer taken from keyboard.

OR

Write a program to insert 10 items in a vector and all of their values are 6 using an
STL algorithm, after that remove 5 elements from that vector starting from the index
2.

5. a) What is a *stream*? Write stream classes hierarchy for console I/O operations.   3   CO1   U

Or

What is *manipulator*? Formulate the differences between manipulators and ios
member functions.

b) Design an *inserter* for a class named VECTOR which has two private integer   3   CO1   A
members named x and y.

OR

Design an *extractor* for a class named VECTOR which has two private integer
members named x and y.

c) Write a program to create a *file* named "templeRun.txt". If the file does not exist, store   4   CO3   A
an integer taken from the keyboard. This integer refers to the high score. If the file
does exist then read the integer it contains and show output:

    Highscore : xxxxx

where xxxxx denotes the value templeRun.txt contains.

OR

Design a program to write the following information to a *file* called WhoAreYou.txt :

Name: xxxxxxx
Semester: Autumn 2022
Course Code: CSE-1221
Course Title: Computer Programming 2.

International Islamic University Chittagong
Department of Computer Science & Engineering
B.Sc. in CSE Semester Final Examination, Autumn -2022
Course Code: CSE-1223 Course Title: Discrete Mathematics

Time: 2.30 hours   Full marks: 50

Course Outcomes (COs) of the Questions	
CO1	Understand fundamental concept of different discrete structures and logical arguments.
CO2	Analyze mathematical proofs to solve problems.
CO3	Apply the knowledge into application such as in problem solving and designing.

Bloom's Levels of the Questions						
Letter Symbols	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group -A   CO   DL
Answer the following Questions

1. a) Prove that if a and b are nonzero integers, a divides b, and $a + b$ is odd, then a is odd.   2 CO2 App
Or
Prove that if a is a positive integer, then 4 does not divide $a^2 + 2$

b) Find each of these values.   2 CO2 App
   a) $(177 \bmod 31 + 270 \bmod 31) \bmod 31$
   b) $(177 \bmod 31 \cdot 270 \bmod 31) \bmod 31$

c) Write down the differences between GCD and LCM? The answer should include 3 CO1 U
appropriate example for both types.
Or
Define Linear Congruence. What are the solutions of the linear congruence
$3x \equiv 4 \pmod 7$

d) Find x using Chinese remainder theorem, if possible, such that   3 CO2 App
   $2x \equiv 5 \pmod 7$, and
   $3x \equiv 4 \pmod 8$

2. a) Write the 1st and 2nd principle of mathematical induction .Why mathematical induction 3 CO1 R
is valid?
b) Use mathematical induction to prove that n^3-n is divisible by 3 whenever n is a positive 3 CO3 App
integer.
Or
Use mathematical induction to prove that the sum of the first n positive odd integers is
n^2.

c) Explain Chinese Remainder Theorem with example.   4 CO2   U

Or

Show that if n is an integer greater than 1, then n can be written as the product of primes

Group -B

Answer the following Questions

3. a) How many different three-letter initials with none of the letters repeated can people   2 CO2   U
have?

b) How many bit strings are there of length six or less, not counting the empty string?   2 CO1   U

c) A bowl contains 10 red balls and 10 blue balls. A woman selects balls at random   3 CO2   U
without looking at them.

i) How many balls must she select to be sure of having at least three balls of the same color?

ii) How many balls must she select to be sure of having at least three blue balls?

Or

Suppose a license plate containing three letters followed by two digits with the last digit not zero. How many different license plates can be printed?

d) State the pigeonhole principle. Explain how pigeonhole principle can be used to show   3 CO1   U
that among any 11 integers, at least two must have the same last digit.

4. a) Define with example: simple graph and bipartite graph.   2 CO1   R

b) State the Handshaking theorem of a graph. Verify this theorem for the following graph.   2 CO2   U
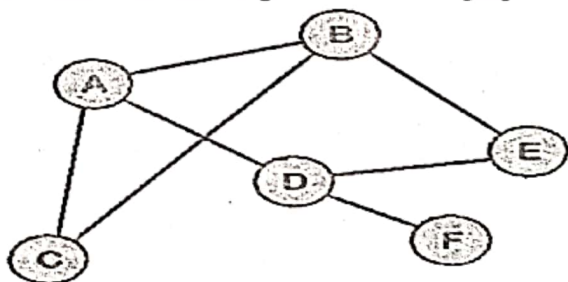
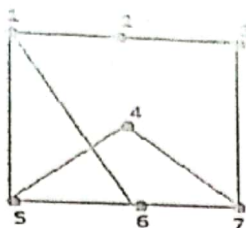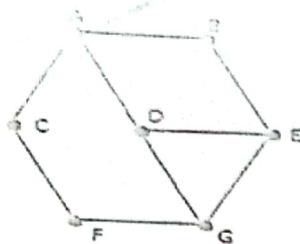c) Find the Euler path and circuit of the following graph   3 CO3   App
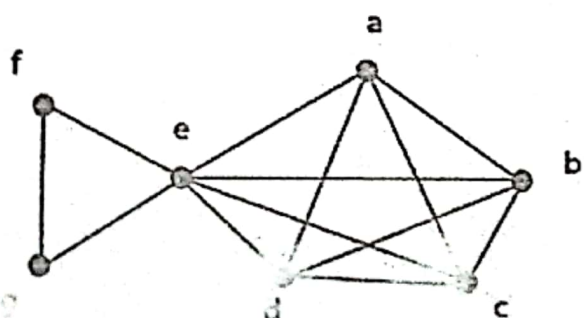
Or

What do you mean by isomorphism of graphs? Determine whether the given pair of

d) What do you mean by Incidence Matrices? Draw the graph by the following Incidence   3   CO2   U
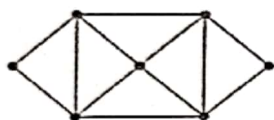Matrices.

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 & 0 \end{bmatrix}$$

5. a) Explain why every tree is a bipartite graph.   2   CO1   U
Or

Write down the differences between Graph and Tree with example.

b) Find two different spanning trees of the graph   2   CO2   U

Or

Which of the following graphs are trees?

a. $G = (V, E)$ with $V = \{a, b, c, d, e\}$ and
   $E = \{\{a, b\}, \{a, e\}, \{b, c\}, \{c, d\}, \{d, e\}\}$
b. $G = (V, E)$ with $V = \{a, b, c, d, e\}$ and $E = \{\{a, b\}, \{b, c\}, \{c, d\}, \{d, e\}\}$
c. $G = (V, E)$ with $V = \{a, b, c, d, e\}$ and $E = \{\{a, b\}, \{a, c\}, \{a, d\}, \{a, e\}\}$
d. $G = (V, E)$ with $V = \{a, b, c, d, e\}$ and $E = \{\{a, b\}, \{a, c\}, \{d, e\}\}$

c) For each degree sequence below, decide whether it must always, must never, or could   3   CO2   App
possibly be a degree sequence for a tree. Remember, a degree sequence lists out the
degrees (number of edges incident to the vertex) of all the vertices in a graph in non-
increasing order.

a. $(4,1,1,1)$
b. $(3,3,2,1,1)$
c. $(2,2,2,1,1)$
d. $(4,4,3,3,3,2,2,1,1,1,1,1,1)$

d) Write down the differences between prim's and kruskal algorithms with example.   3   CO1   U
Or

Define with figure: graph coloring, simple graph and weighted graph.