

**International Islamic University Chittagong**  
**Morality Development Program (MDP)**  
**Semester End Examination**

**Autumn-2024**

**Course Code: MDP-1202**

**Duration: 2:30 Hours**

**2nd Semester**

**Tajweedul Qur'an Part-II**

**Marks: 50**

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**Answer 5 questions from the following questions.**

**Question No - 1**

**(10)**

Write the meaning of the following Surahs. (Any two)

A) Surah Al-Humazah      B) Surah Al-Takasur      C) Surah Al- Asr

**Question No - 2**

**(10)**

Write the impact of Salat (Namaz) on human life.

**Question No - 3**

**(10)**

Write the system of performing four rakat Salat (Namaz).

**Question No - 4**

**(10)**

Mention the starting and ending time of five daily prayers (Salah).

**Question No - 5**

**(10)**

Explain how to perform Salat Al-Witr.

**Question No - 6**

**(10)**

Write down the importance of reciting the holy quran.

**Question No - 7**

**(10)**

Write the meaning of Surah Al-Fil, including the story of it.

**International Islamic University Chittagong**  
**Center for General Education (CGED)**  
 Semester End Examination, Autumn-2024

**Course Code: URED-1201 Course Title: Basic Principles of Islam**

**Full Marks: 50**

**Time: 2 Hours 30 Minutes**

**(Answer all questions. The right side columns contain marks, CLOs, and Bloom's taxonomy domain for each question):**

#	Questions	Marks	CLOs	Bloom's taxonomy domain
1	<p>a) "I created not the Jinn and Mankind except that they should worship Me"- evaluate this <i>Ayah</i> by explaining some objectives and conditions of '<i>Ibadah</i> elaborately.</p> <p style="text-align: center;">Or,</p> <p>b) What is '<i>Ibadah</i>? Explain some essential characteristics of '<i>Ibadah</i> from the viewpoint of Islam.</p>	10	3	Evaluate & Create Remember & Create
2	Define <i>Salah</i> literally and terminologically. Summarize some prerequisites ( <i>Shurut</i> ) and pillars ( <i>Arkan</i> ) of .	10	3	Remember & Create
3	<i>Zakah</i> is the best way to alleviate poverty in our society"- judge this statement properly.	10	3	Evaluate
4	"Fasting is only for Me, and I will give the reward for it"- explain this Hadith by summarizing the benefits of fasting elaborately.	10	3	Create
5	" <i>Hajj</i> is a revival of the Muslim <i>Ummah</i> "- justify this statement by explaining some essential works of <i>Hajj</i> and their impact on human life.	10	3	Evaluate & Create

# International Islamic University Chittagong

Department of Computer Science & Engineering

B. Sc. in CSE Semester Final Examination, Autumn-2024

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

Total marks: 50 Time: 2 hours 30 minutes

## Group-A

- 1.
- a) Define operator overloading and explain its limitations. Provide examples of operators that cannot be overloaded and explain why. 2 CO2
  - b) Implement a class Temperature that overloads the decrement (--) operator using a friend function. 3 CO2
  - c) Write a program to overload the == operator to compare two objects of a class Rectangle for equality based on their dimensions. 5 CO2

Or,

Implement a class Temperature that overloads the relational operator (<) to compare two temperatures.

- 2.
- a) Explain virtual base classes in C++. Write a program to demonstrate its use to solve the diamond problem in inheritance. 5 CO2

Or,

Explain constructors in derived classes. Write a program to demonstrate the use of base class parameterized constructors in a derived class.

- b) Find the output of the following C++ program and explain the output. 2 CO3

```
#include <iostream>
using namespace std;
class A { public: void show() { cout<< "Class A" << endl; } };
class B : public A { public: void show() { cout<< "Class B" << endl; } };
class C : public B { public: void show() { cout<< "Class C" << endl; }
    void callBaseFunctions() { A::show(); B::show(); } };
int main() { C obj; obj.show(); obj.callBaseFunctions(); return 0; }
```

- c) Discuss the advantages and disadvantages of multiple inheritance in C++. 1 CO2
- d) Is there any error in this code? If yes, then correct the code. Display the output. 2 CO2

```
class A {
    public:
        void cheers() {
            cout<<"Class A: Hip-hip-hooray";
        }
};
class B {
    public:
        void cheers() {
            cout<<"Class B: Hip-hip-hooray";
        }
};

class C: public A, public B
{
};

int main()
{
    C obc;
    obc.cheers();
}
```

## Group-B

- 3.
- a) Define polymorphism in OOP and differentiate between early binding and late binding. 3 CO1
  - b) Create a C++ program that simulates a simple banking system using inheritance and polymorphism. Design base classes for accounts and derived classes for different types of accounts (e.g., savings, checking). Implement virtual functions to handle account transactions. 2 CO3
  - c) Explain the concept of a pure virtual function. Write a program with an abstract class containing at least one pure virtual function. 3 CO2
  - d) Write the output of the following program: 2 CO2

```

#include <iostream>
using namespace std;
class A
{
public:
    virtual void print(){
        cout << "A class print function \n";
    }
    void show(){
        cout << "A class show function \n";
        this -> print();
    }
};

```

```

class B: public A {
public:
    void print() {
        cout << "B class print function \n";
    }
    void show() {
        cout << "B class show function \n";
        this -> print();
    }
};
int main() {
    A *b = new B;
    b -> show();
    return 0;
}

```

4.

- a) Write a program to demonstrate exception handling for dividing two integers. The program should throw an exception if a division by zero is attempted. Include throwing, catching, and rethrowing mechanisms in your implementation. 3 CO3
- b) Create a C++ program with a generic function called **findMax** to find the maximum value in an array of any data type using templates. In the main function, show how to use **findMax** for integer, floating-point, and character arrays, demonstrating the power of templates for working with different data types. 3 CO3

**Or,**

Write a generic class template **Box** that stores a value of any data type. Add member functions to set and get the value. Demonstrate its use with an integer and a string.

- c) Write a program that initializes a **vector** with the values {10, 20, 30, 40, 50}. Perform the following operations: 4 CO3

1. Insert 10 at the beginning.
2. Remove the at index 2
3. Replace the element at index 2 with 25.
4. Sort the vector in ascending order.
5. Display all elements in the vector.

5.

- a) Write a C++ code using manipulator to provide the following output specification for printing float value. 3 CO3
- 1) 12 column widths
  - 2) Right justified
  - 3) Two precisions
  - 4) Filling unused place with sign
  - 5) Trailing zeros shown are display + sign as first position.

**Or,**

Using I/O manipulators, write a program to display a floating-point number with:

- Width: 10
- Precision: 3
- Left-justified and filled with \*.

- b) Explain the difference between formatted and unformatted I/O. Write a program to demonstrate both. 3 CO3
- c) Write a program to write student details (**name, ID, CGPA**) into a file named **students.txt**. Then read the file and display its contents on the console. 4 CO3

**Or,**

Write a program to read employee details (**name, ID, salary**) from the user and write them to a file named **employees.txt**. Then read and display the file contents.

**International Islamic University Chittagong (IIUC)**  
**Department of Computer Science and Engineering (CSE)**  
**Semester Final Examination**

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



**Semester: Autumn-2024**  
**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**

<b>CLO2:</b>	Solve differential equations using various methods.
<b>CLO3:</b>	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**

- |  |   |
|--|---|
| <p>1. a) Define order and degree of differential equation. Write down the order and degree of the following differential equations</p> <p>(i) <math>\cos x \frac{d^2y}{dx^2} + \sin x (\frac{dy}{dx})^2 + 8y = \tan x</math>    (ii) <math>\left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 = \left(\frac{d^2y}{dx^2}\right)^2</math></p> <p>(iii) <math>\frac{dy}{dx} + \sin\left(\frac{dy}{dx}\right) + x + 2y = 0</math>    (iv) <math>\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2} = \frac{d^2y}{dx^2}</math></p> <p>b) Define ordinary differential equation with example. Solve the differential equation <math>(x + y)^2 \frac{dy}{dx} = a^2</math></p> <p>Or) Define homogeneous differential equation with an example. Solve the differential equation <math>(2x - 5y + 3)dx - (2x + 4y - 6)dy = 0</math></p> <p>2. a) Define Bernoulli's differential equation. Solve the Bernoulli's differential equation <math>\frac{dy}{dx}(x^2y^3 + xy) = 1</math>.</p> <p>b) Define integrating factor. Test whether the differential equation <math>(2x^3y^3 - x^2) dy + (3x^2y^4 + 2xy) dx = 0</math> is exact or not. If not then make it exact. Hence solve it</p> <p>Or) Define linear differential equation with constant coefficients. Find the particular integral of the following differential equation<br/> <math display="block">\frac{d^3y}{dx^3} - 3 \frac{d^2y}{dx^2} + 4 \frac{dy}{dx} - 2y = e^{-x} + 1 + \cos 2x.</math></p> | <p>Marks      CLO      DL</p> <p>5      CLO2      U</p> <p>5      CLO2      U</p> <p>5      CLO2      U</p> <p>5      CLO2      U</p> |
|--|---|

**Group - B**

		Marks	CLO	DL
3.	a) Define Bessel's equation. Using Bessel's function prove that, $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$	5	CLO2	U
	b) Define Legendre's equation. Using the Rodrigue's formula evaluate the values of $P_3(x)$	5	CLO2	U
4.	a) Apply the method of variation of parameters to solve the ordinary differential equation $(D^2 + 4)y = 4\tan 2x$	5	CLO2	U
	Or) Solve the linear differential equation by the method of Undetermined Coefficients $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} - 5y = x^2 + 2e^{3x}$ .	5	CLO2	U
	b) Define partial differential equation (pde). Solve the linear pde by Lagrange's method $(z^2 - 2yz - y^2)p + (xy + xz)q = xy - xz$	5	CLO2	U
	Or) Solve the non-linear partial differential equations by Charpit's method, $(p^2 + q^2)y = qz$	5	CLO3	Ap
5.	a) 35 <sup>th</sup> July 2024, an activist of the 'Anti-Discrimination Students Movement' was seriously injured at Jatra Bari, Dhaka. Other activists brought him to Dhaka Medical College Hospital at 11:00 pm, and the doctor discovered that he was dead. The doctor took the temperature of the body at 11:30 pm, which was 94.6°F. He again took the temperature after one hour, which showed 93.4°F, and noticed that the temperature of the morgue of DMCH was 70°F. If the normal temperature of the human body is 98.6°F, then form a differential equation, and by solving it, estimate the time of death.	5	CLO3	Ap
	b) 36 <sup>th</sup> July 2024, the activists of the 'Anti-Discrimination Students Movement' of New Market, Chattogram, increased at a rate proportional to the number that was present that time $t$ . The number of activists doubled in one hour. Form a differential equation, and by solving it, find how long it took for the number to triple.	5	CLO3	Ap

**BismillahirRahmanir.Rahim**  
 International Islamic University Chittagong  
 Department of Computer Science & Engineering  
*B. Sc. in CSE Semester Final Examination, Autumn-2024*  
**Course Code: EEE-1221 Course Title: Electronics**  
 Total marks: 50 Time: 2 hours 30 minutes

[Answer **all** the questions. Figures in the right hand margin indicate full marks.  
 Separate answer script must be used for Group A and Group B]

**Group-A**

1. a) What is JFET? Draw the symbol of N-Channel JFET and P-Channel JFET. Describe the working principle of N-Channel JFET. CLO2 U 5
- OR,
- What is threshold voltage in MOSFETs? Describe the basic working principle of an enhancement-mode N-channel MOSFET.
- b) Sketch the transfer characteristics curve of n-channel enhancement type of MOSFET if  $V_T = 2V$  and  $k=0.5 \times 10^{-3} A/V^2$ . CLO3 An 5
2. a) Design a Multivibrator circuit that can generate square wave output with no stable state. Explain its operation. CLO2 Ap 5

OR,

- What is a switching circuit? Explain the switching action of a transistor with the help of output characteristics.
- b) In an astable multivibrator,  $R_2 = R_3 = 10 k\Omega$  and  $C_1 = C_2 = 0.01 \mu F$ . Determine the period and frequency of the square wave. CLO3 An 5

**Group-B**

3. a) What is an operational amplifier (op-amp)? Derive the expression for the voltage gain of an inverting amplifier. CLO2 U 5
- b) Draw the output voltage waveform with proper mathematical expression for the circuit given in Fig. 3(b). CLO3 An 5

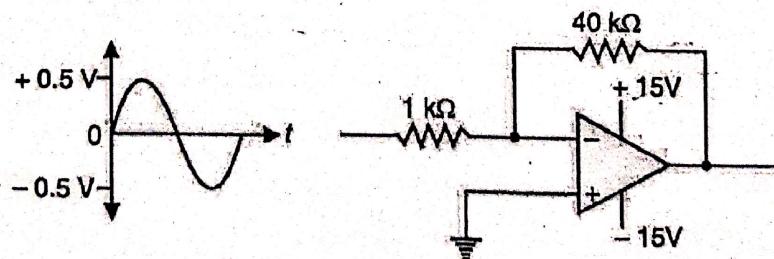


Fig. 3(b)

4. a) Show that output is the differentiation of the input with an inversion and scale multiplier of RC. CLO2 Ap 5

OR,

What is negative feedback? Explain the principle of negative feedback in amplifier.

- b) When negative voltage feedback is applied to an amplifier of gain 200, the overall gain falls to 100.
- (i) Calculate the fraction of the output voltage feedback.
  - (ii) If this fraction is maintained, calculate the value of the amplifier gain required if the overall stage gain to be 150.
- CLO3 An 5

5. a) Write a short note on comparator circuit and characteristics of it with proper diagram. CLO3 U 5

OR,

Design and explain a circuit that can detect the peak value of an incoming unknown varying signal.

- b) What is Precision Rectifier? Explain Precision Rectifier with proper circuit diagram. CLO3 An 5

# International Islamic University Chittagong

## Department of Computer Science and Engineering

B. Sc. in CSE Semester Final Examination, Autumn 2024

Course Code: CSE 1223 Course Title: Discrete Mathematics

Total marks: 50

Time: 2 hours 30 minutes

[Answer all the questions; in some questions, there are options; you will solve any one of them; Figures in the right-hand margin indicate full marks. Separate answer script must be used for Group-A and Group-B]

### Group-A

1. a) Let  $n$  and  $d$  be positive integers. How many positive integers not exceeding  $n$  are divisible by  $d$ ? 2 CO3 U

Or,

Proof that, If  $n$  is a composite integer, than  $n$  has a *prime divisor* less than or equal to  $n$ .

- b) Define **Linear Congruence**. What are the solutions of the linear congruence 3 CO1 Ap

$$17x \equiv 14 \pmod{21}$$

Or,

Express  $\gcd(144, 89)$  as a linear combination of 144 and 89. Show the steps.

- c) State the **encryption function** known as Caesar Cipher. Find the greatest common divisors of the following using prime factorizations: 2 CO1 U

i. 120

ii. 500

- d) Use **Chinese remainder theorem** to find the smallest positive integer  $x$  such that 3 CO2 Ap

$$x \equiv 2 \pmod{3}$$

$$x \equiv 5 \pmod{7}$$

$$x \equiv 3 \pmod{11}$$

2. a) State the 1st and 2nd principles of mathematical induction. Why Mathematical Induction is valid? 3 CO1 U

- b) Give a direct proof of the theorem "If  $n$  is an odd integer, then  $n^2$  is odd." 3 CO1 Ap

Or,

Prove that  $\sqrt{7}$  is irrational by giving proof by contradiction.

- c) Prove by mathematical induction that the sum of the series 4 CO1 Ap

$$2 + 2.4 + 2.4^2 + \dots + 2.n^2 = 2.(4^{n+1} - 1) / 3$$
 for all nonnegative integers  $n$ .

Or,

Using *mathematical induction* show that, for all  $n \geq 1$ , prove that,

$$1.2.3 + 2.3.4 + 3.4.5 + \dots + n(n+1)(n+2) = \{n(n+1)(n+2)(n+3)\} / 4$$

### Group-B

3. a) Each user on a computer system has a password that is eight to ten characters long, where each character is either an uppercase letter, lowercase letter, or a digit. Each password must contain at least one uppercase letter and one digit. How many possible passwords are there? 4 CO2 Ap

- b) State the **generalized pigeonhole principle**. What is the minimum number of students required in a protest to ensure that at least 20 will be in the same location, given there are 5 locations: Bohoddarhat, New Market, Tiger Pass, GEC, and 2 No Gate? 3 CO2 Ap

- c) A bit string is formed of 0 or 1, where the length of the string is 10.  
 How many possible outcomes  
 i. contain exactly four 1s  
 ii. contain at most four 1s  
 iii. contain an equal number of 0s and 1s

3 CO2 Ap

Or,

A candy store sells 3 different flavors of candy: *chocolate*, *vanilla*, and *strawberry*. How many different ways can 10 pieces of candy be selected if a customer can choose any combination of the three flavors? Assume that only the number of candies of each flavor matters, and the order in which they are chosen does not matter.

4.

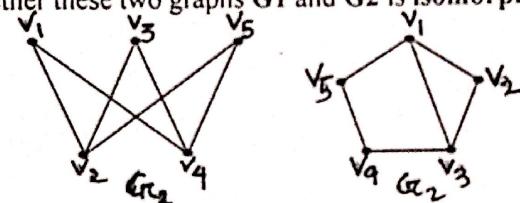
- a) Define with example:

i) Planer Graph ii) Complete Graph iii) Bipartite Graph

- b) Determine whether these two graphs G1 and G2 is isomorphic or not?

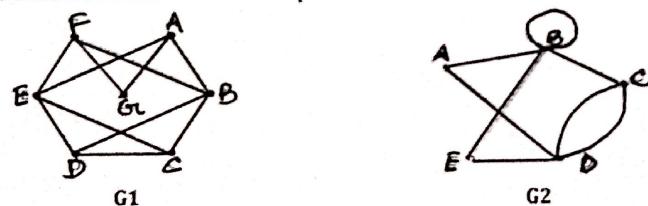
3 CO3 U

3 CO3 Ap



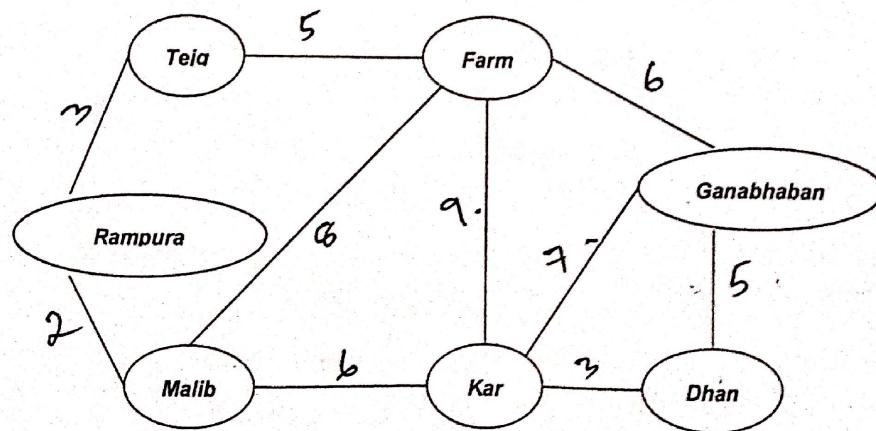
- c) Determine whether the following graph G1 and G2 has an Euler circuits or path? Construct such a circuit or path if exists.

4 CO3 Ap



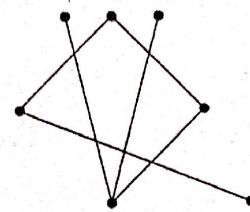
Or,

A group of students planned to go to **Ganabhaban** from **Rampura** during the long march to Ganabhaban. Find the shortest path in the following graph using Dijkstra's algorithm. While writing in the answer script, you can use the short forms of each location (R, T, F, G, M, K, D).

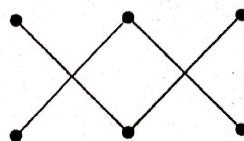


5.

- a) Define full m-ary tree. Also determine which of the following graphs are not trees.



G1

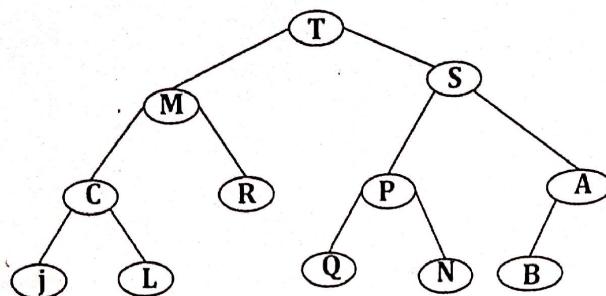


G2

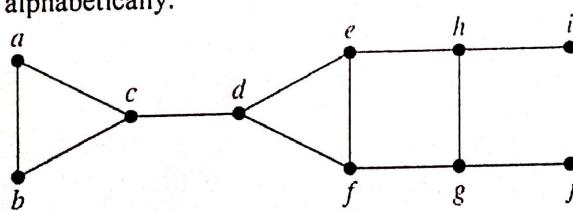
3 CO3 U

- b) Find inorder, preorder and postorder traversal of the following tree.

3 CO3 Ap

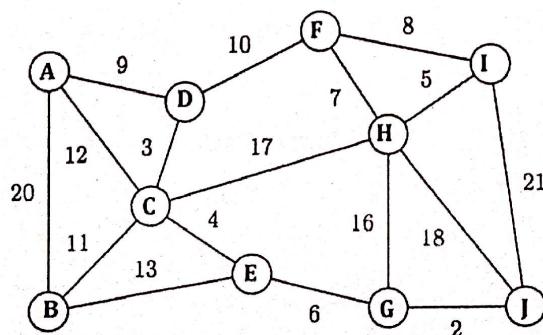
*Or,*

Use Breadth-first-search(BFS) to find a spanning tree for the following graph. Choose a as the root of this spanning tree and assume that the vertices are ordered alphabetically.



- c) Distinguish between Prim's and Krushkal algorithm. Construct a minimum spanning tree of the following graph using Prims algorithm.

4 CO3 Ap



[Answer **all** the questions. Figures in the right hand margin indicate full marks.  
Separate answer script must be used for Group A and Group B]

**Group-A**

1. a) Define: i) Crystal ii) Unit Cell CLO1 R 2
1. b) Define packing fraction. Show that the packing fraction for a bcc lattice is  $\sim 0.68$  and hence write the meaning of this number. CLO2 U 5

or

Write down the name of seven crystal system along with their properties.

1. c) For a simple cubic lattice of lattice parameter 2.04 Å, calculate the spacing of lattice planes (212). CLO3 An 3
2. a) Define Miller indices and draw the plane of (010), (101), (001) and (011). CLO1 U 5
2. b) How many types of crystal defects in solid? Explain all of the crystal defects. CLO1 U 5

or

Distinguish between metals, semiconductors, and insulators based on their energy band structure.

**Group-B**

3. a) Demonstrate how Einstein's famous mass-energy relation can be derived using the fundamental principles of special relativity. CLO2 U 7
3. b) A particle is moving with a speed of 0.6c. Calculate the ratio of its rest mass and the mass while in motion. CLO3 An 3
4. a) State and explain Bragg's law of crystal diffraction. CLO2 U 3
4. b) Calculate the following properties of alpha particle( ${}^{12}_6C$ ): CLO3 An 7
  - i. Nuclear Mass
  - ii. Nuclear Size
  - iii. Nuclear Density
  - iv. Nuclear Charge
  - v. Nuclear Mass defect
  - vi. Nuclear Binding Energy
  - vii. Nuclear Binding Energy per nucleon.
5. a) Derive the mathematical expression for radioactive decay and hence show that the number of radioactive atoms decreases exponentially over time. CLO2 U 7

or

Based on Bohr atomic model, show that the binding energy of the hydrogen atom in the  $n^{\text{th}}$  orbit is  $\frac{13.6}{n^2}$  eV.

5. b) The half-life of a radioactive substance is 55 days. Calculate CLO3 An 3
  - (i) The radioactive decay constant
  - (ii) The time for 1/4 of the original number of atoms to remain unchanged.

or

If X-rays of wavelength  $0.5\text{Å}^\circ$  are detected at an angle of  $5^\circ$  in the first order, what is the spacing between the adjacent planes of the crystal?