

Patuakhali Science and Technology University
Faculty of Computer Science and Engineering
Dept. of Computer and Communication Engineering
Dumki, Patuakhali-8602, Bangladesh

Final Examination of B. Sc. Engineering in CSE Level: 1 Semester: II Session: 2019-2020

Course Code	Course Title	July December 2020	Credit: 03
CCE-121	Object Oriented Programming		Time: 03 Hr Marks: 70

Answer any 05 out of 06 Questions (Split answers are highly discouraged)

1 [A] Explain the purpose of an instance variable. Differentiate between an instance variable and a class variable. **4**

[B] Explain the purpose of a method parameter. What is the difference between a parameter and an argument? Explain with an example. **4**

[C] Write Java code that calculates and prints the sum of the integers from 1 to n. Use a while statement to loop through the calculation and increment statements. The loop should terminate when the value of x becomes n+1. **3**

[D] i) Suppose x = 2 and y = 3. Show the output, if any, of the following code. What is the output if x = 3 and y = 2? What is the output if x = 3 and y = 3? **3**

```
if(x > 2)
if(y > 2) {
    int z = x + y;
    System.out.println("z is " + z);
}
else
    System.out.println("x is " + x);
```

ii) What does the following code print?
System.out.printf("%*%n***%n***%n*****%n*****%n");

2 [A] What type of repetition would be appropriate for calculating the sum of the first 100 positive integers? **4**
What type would be appropriate for calculating the sum of an arbitrary number of positive integers?

Briefly describe how each of these tasks could be performed with an example.

[B] Write a Java program to check if three given side lengths (integers) can make a triangle or not. **3**

[C] i) What is y after the following switch statement is executed? Rewrite the code using an If-else statement. **2+2**

```
x = 3; y = 3;
switch (x + 3) {
case 6: y = 1;
default: y += 1;
}
```

ii) Fill in the blanks in each of the following statements:

a) Typically, statements are used for counter-controlled repetition and statements for sentinel-controlled repetition.

b) The do while statement tests the loop-continuation condition executing the loop's body; therefore, the body always executes at least once.

c) The statement selects among multiple actions based on the possible values of an integer variable or expression, or a String.

d) The statement, when executed in a repetition statement, skips the remaining statements in the loop body and proceeds with the next iteration of the loop.

[D] Write a program that prompts the user to enter a three-digit integer and determines whether it is a palindrome number. A number is palindrome if it reads the same from right to left and from left to right. Here is a sample run of this program: **3**

Enter a three-digit integer: 121

121 is a palindrome

Enter a three-digit integer: 123

123 is not a palindrome

- 3 [A] Find the error in each of the following program segments. Explain how to correct the error.

4

```
a) void g()
{
    System.out.println("Inside method g");
}

void h()
{
    System.out.println("Inside method h");
}

b) int sum(int x, int y)
{
    int result;
    result = x + y;
}
```

```
c) void f(float a);
{
    float a;
    System.out.println(a);
}

d) void product()
{
    int a = 6, b = 5, c = 4, result;
    result = a * b * c;
    System.out.printf("Result is %d\n",
    result);
    return result;
}
```

- [B] A positive integer is prime if it's divisible by only 1 and itself. For example, 2, 3, 5 and 7 are prime, but 4, 6, 8 and 9 are not. The number 1, by definition, is not prime. 4

- Write a method that determines whether a number is prime.
- Use this method in an application that determines and displays all the prime numbers less than 10,000. How many numbers up to 10,000 do you have to test to ensure that you've found all the primes?
- Initially, you might think that $n/2$ is the upper limit for which you must test to see whether a number n is prime, but you need only go as high as the square root of n . Rewrite the program, and run it both ways.

- [C] Write an application that calculates the average of a series of integers that are passed to method average using a variable-length argument list. Test your method with several calls, each with a different number of arguments. 3

- [D] Write a java code to initialize the elements of an array with an array initializer. 3

- 4 [A] a) Explain the life cycle of a thread with block diagram. Give real life examples of multi-threading and multi-tasking. 7
b) Write a Java Program to implement inheritance and demonstrate use of method overriding.

- [B] Write a program Using inheritance to create an exception superclass (called **ExceptionOne**) and exception subclasses **ExceptionTwo** and **ExceptionThree**, where **ExceptionTwo** inherits from **ExceptionOne** and **ExceptionThree** inherits from **ExceptionTwo**. Write a program to demonstrate that the catch block for type **ExceptionOne** catches exceptions of types **ExceptionTwo** and **ExceptionThree**. 7

- 5 [A] i. Distinguish between method overloading and method overriding.
ii. Write a java program to store instructor information (NID, Name, Dept, Salary) into database. 7

- [B] Write a Java program to Create class **SavingsAccount**. Use a static variable **annualInterestRate** to store the annual interest rate for all account holders. Each object of the class contains a private instance variable **savingsBalance** indicating the amount the saver currently has on deposit. Provide method **calculateMonthlyInterest** to calculate the monthly interest by multiplying the **savingsBalance** by **annualInterestRate** divided by 12—this interest should be added to **savingsBalance**. Provide a static method **modifyInterestRate** that sets the **annualInterestRate** to a new value. Write a program to test class **SavingsAccount**. Instantiate two **savingsAccount** objects, **saver1** and **saver2**, with balances of \$2000.00 and \$3000.00, respectively. Set **annualInterestRate** to 6%, then calculate the monthly interest for each of 12 months and print the new balances for both savers. Next, set the **annualInterestRate** to 5%, calculate the next month's interest and print the new balances for both savers. 7

- 6 [A] i. Why are exceptions particularly appropriate for dealing with errors produced by methods of classes in the Java API?
ii. Write a java program to catch **NumberFormatException** and **ArithmaticException**. In the 'finally' section make sure that it prints "No error" if exception does not occur, otherwise write "Oh! Error!"

- [B] Design a basic payroll system of to include private instance variable **birthDate** in class **Employee**. Use class **Date** to represent an employee's birthday. Add get methods to class **Date**. Assume that payroll is processed once per month. Create an array of **Employee** variables to store references to the various employee objects. In a loop, calculate the payroll for each **Employee** (polymorphically), and add a \$500.00 bonus to the person's payroll amount if the current month is the one in which the employee's birthday occurs. [You have a right to add necessary class and methods according to your logic] 7

Faculty of Computer Science and Engineering

Patuakhali Science and Technology University

Final Examination of B. Sc. Engg.(CSE) July-December 2020

Level-1, Semester-II (Session:2019-2020)

Course Code: CIT-123, Course Title: Discrete Mathematics

Time: 3 Hours

Full Marks: 70

N.B: Answer any seven questions from the followings. (split answers are highly discouraged)

1. (a) What is discrete mathematics? What kinds of problems are solved using discrete mathematics? 2
- (b) Find: (i) $[7.5], [-.999]$ (ii) $[7.5], [-7.5]$ 2
- (c) Find the power set $P(A)$ of $A = \{\{a, b\}, \{c\}, \{d, e, f\}\}$ 2
- (d) List the elements of the following sets; here $Z = \{\text{integers}\}$. 3

- (i) $A = \{x: x \in Z, 3 < x < 9\}$
- (ii) $B = \{x: x \in Z, x^2 + 1 = 10\}$
- (iii) $C = \{x: x \in Z, x \text{ is odd, } -5 < x < 5\}$

- (e) Describe in words how you would prove each of the followings: 2

- (i) A is equal to B
- (ii) A is subset of B
- (iii) A is a proper subset of B
- (iv) A is not a subset of B

- (f) Let $B_1 = \{1, 2\}$, $B_2 = \{3, 4\}$, $B_3 = \{5, 6\}$ Find $\prod B_i$ 3

2. (a) Suppose that 100 of the 120 mathematics students at a college take at least one of the languages French, German, and Russian. Also suppose 7

65 study French	20 study French and German
45 study German	25 study French and Russian
42 study Russian	15 study German and Russian

- (i) Find the number of students who study all three languages.

(ii) Fill in the correct number of students in each of the eight regions of the Venn diagram of Fig. 1-1. Here F , G and R denote the sets of students studying French, German, and Russian respectively.

- (iii) Determine the number K of students who study (x) exactly one language, and (y) exactly two languages

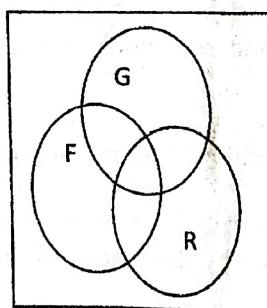


Figure: 1-1

- (b) Find: (i) $(A \cup B)^c$ and (ii) $A^c \cap B^c$ 2

- (c) Shade the set $A \cap B \cap C^c$ 3

- (d) Show that the following argument is not valid by constructing a Venn diagram in which the premises hold but the conclusion does not hold: 2

S_1 : Some students are lazy.

S_2 : All males are lazy.

S : Some students are males.

3. (a) Define the graph of function $f : A \rightarrow B$ 2

- (b) Sketch the graph of the function $g(x) = x^4 - 10x^2 + 9$ 3

- (c) Which of the functions in fig: 2-1 are one-to-one and onto? 4

10/9
65
32
2

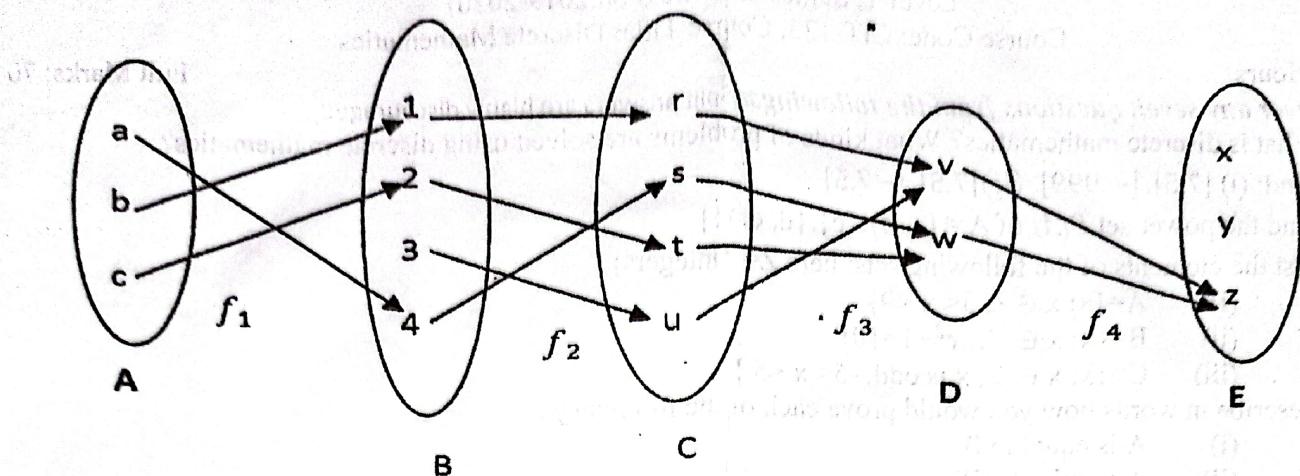


Figure: 2-1

(d) Find the number of elements in each finite set:

- (i) $A = \{2, 4, 6, 8, 10\}$
- (ii) $B = \{x : x^2 = 4\}$
- (iii) $C = \{x : x > x+2\}$
- (iv) $D = \{x : x \text{ is a positive integer, } x \text{ is a divisor of } 15\}$
- (v) $E = \{\text{Letters in the alphabet preceding the letter } m\}$
- (vi) $F = \{x : x \text{ is a solution to } x^3 = 27\}$

(e) Given $A = \{1, 2\}$, $B = \{a, b, c\}$, and $C = \{c, d\}$. Find: (i) $(A \times B) \cap (A \times C)$ and (ii) $A \times (B \cap C)$.

4. (a) Define proposition. Show that $\neg(p \rightarrow q)$ and $(p \wedge \neg q)$ are logically equivalent. To model the 8-queens problems as a satisfiability problem. Solve the problem where one queen in each row, no column contains more than one queen, and no diagonal contains two queens.

(b) Let $P(x)$ denote the statement " $x > 3$." What is the truth value of the quantification $\exists x P(x)$, where the domain consists of all real numbers?

(c) Define rules of inference, modus ponens, and resolution. Show that the premises $(p \wedge q) \vee r$ and $r \rightarrow s$ imply the conclusion $p \vee s$.

(d) Find the truth table for $(p \rightarrow q) \vee \sim(p \leftrightarrow \sim q)$.

5. (a) What is the limitation of the binary search algorithm? Use the bubble sort algorithm to put 3, 2, 4, 1, and 5 into increasing order.

(b) Define the complexity of an algorithm. Show that $f(x) = x^2 + 2x + 1$ is $O(x^2)$. How many additions of integers and multiplications of integers are used by the matrix multiplication algorithm to multiply two $n \times n$ matrices with integer entries?

(c) Write the formal definition of modular arithmetic. State the Euclidean algorithm for estimating the greatest common divisor, GCD. Find the GCD of 414 and 662 using Euclidean algorithm.

6. (a) Define graph, multigraph and subgraph with figure.

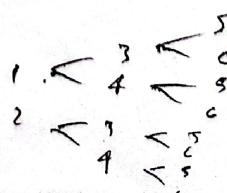
(b) Distinguish between Hamiltonian graph and Eulerian graph.

(c) Draw a graph with six vertices which is Eulerian but not Hamiltonian.

(d) Draw 0-regular, 4-regular, k_5 , and $k_{5,3}$ graph



$$2 + 2 \times 2 \times 2 \times 2 = 2^5$$



Patuakhali Science and Technology University

B.Sc.Engg.(CSE) Level-1 Semester-II Final Examination-2020 (July-December)

Course Code: EEE 121 Course Title: Electronic Devices and Circuits

Credit Hour: 3.0 Full Marks: 70 Duration: 3 Hours.

[Figures in the right margin indicate full marks. Split answering of any question is not recommended.]
Answer any 5 of the following questions.

- | | |
|---|---|
| 1 | (a) What do you meant by <i>crystal diode</i> ? How does a <i>crystal diode</i> work as a switch? 03
(b) "A full-wave rectifier is twice as effective as a half-wave rectifier". Justify the statement. 07
(c) A crystal diode having internal resistance 50Ω is used for half-wave rectification. If the applied voltage $V = 50 \sin \omega t$ and load resistance is 400Ω . Find 04
(i) I_{\max} , I_{dc} , I_{rms}
(ii) a.c. power input and d.c. power input
(iii) d.c. output voltage
(iv) efficiency of rectification |
| 2 | (a) Define <i>ripple factor</i> . "The ripple factor of full-wave rectification is less than that of the half-wave rectification". Explain the statement. 05
(b) Describe the action of the following filter circuits: (i) capacitor filter (ii) choke input filter 06
(iii) capacitor input filter.
(c) The four diodes used in a bridge rectifier circuit have forward resistances which may be considered constant at 1Ω and infinite reverse resistance. The alternating supply voltage is 250V r.m.s. and load resistance is 400Ω . Calculate (i) mean load current and (ii) power dissipated in each diode. 03 |
| 3 | (a) What is <i>tunnel diode</i> ? Explain the tunneling effect and $V-I$ characteristics of tunnel diode. 04
(b) Define <i>transistor</i> . Derive the expression for the collector-current in common base connection of transistor. 04
(c) A transistor is connected in common-emitter (CE) configuration in which collector supply is 10V and the voltage drop across 800Ω load resistance connected in the collector circuit is 0.6V. If $\alpha=0.96$, calculate: i. collector-emitter voltage ii. Base current. 03
(d) Write down the pros and cons of the transistor over vacuum tubes. 03 |
| 4 | (a) Define <i>sinusoidal oscillator</i> . Write down the advantages of sinusoidal oscillator. Why an alternator can not be called oscillator? 03
(b) What is <i>tank circuit</i> ? Describe the construction and circuit operation of the <i>hartley oscillator</i> . 04
(c) What is <i>photo-diode</i> ? Describe the operating principle and applications of photo-diode. 04
(d) A 1 MHz inductor is available. Calculate the capacitor values in a Colpitts oscillator so that $f=1$ MHz and $m_v=0.25$. 03 |
| 5 | (a) Define <i>JFET</i> . Describe the working principle of <i>JFET</i> . Write down the advantages of <i>JFET</i> . 06
(b) Explain the construction and working of <i>UJT</i> . 03
(c) What is <i>MOSFET</i> ? Explain the circuit operation of <i>D-MOSFET</i> . 05 |
| 6 | (a) What do you meant by <i>SCR</i> ? Explain the construction and working principle of <i>SCR</i> . 05
(b) Define <i>triac</i> . Describe the construction and operation of <i>triac</i> circuit. 05
(c) What is <i>diac</i> ? Write down the operating principle of <i>diac</i> . 04 |

Patuakhali Science and Technology University

Department of Physics and Mechanical Engineering

2nd Semester (L-1, S-II) Final Examination of B.Sc. (Engg.) in CSE, July-December: 2020, Session: 2019-2020

Course Code: PHY 121, Course Title: Physics-II

Credit Hour: 3.0, Full Marks: 70, Total Time: 3 Hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended.]

Answer any five (05) from the following questions

1. (a) Define Surface Tension. Give some examples of Surface Tension in our practical experiences. 4
- (b) Show that the excess pressure inside a spherical liquid drop or an air bubble in a liquid is 7
- $$p = \frac{2T}{r} \text{ and inside a soap bubble is } p = \frac{4T}{r}, \text{ where the symbols have their conventional meanings.}$$
- (c) (i) A student, using a circular loop of wire and a pan of soapy water, produces a soap bubble whose radius is 1.0 mm. The surface tension of the soapy water is $T = 2.5 \times 10^2 \text{ N/m}$. Determine the pressure difference between the inside and outside of the bubble. (ii) The same soapy water is used to produce a spherical droplet whose radius is one-half that of the bubble, or 0.50 mm. Find the pressure difference between the inside and outside of the droplet. 3
2. (a) Illustrate and explain seven crystal systems or structure with proper example. 7
- (b) Write short note on: (i) Allotropy, (ii) Crystal Defect. 2+2
=4
- (c) Draw Miller planes for the given indexes: (111); (200). Interpret importance of Miller Planes. 2+1
=3
3. (a) What is interference of light. Write down the conditions for interference. 3
- (b) Describe Young's double-slit experiment and derive an expression for (i) intensity at a point on the screen, and (ii) fringe-width. 7
- (c) Find the pit depth in a CD that has a plastic transparent layer with index of refraction of 1.60 and is designed for use in a CD player using a laser with a wavelength of $7.80 \times 10^{-7} \text{ nm}$ in air. 4
4. (a) Describe the diffraction of light waves by a narrow opening and an edge, and also describe the resulting interference pattern. 4
- (b) With a sketch, describe the arrangement for a single-slit diffraction experiment. 6
- (c) Monochromatic light from a helium-neon laser ($\lambda = 632.8 \text{ nm}$) is incident normally on a diffraction grating containing $6.00 \times 10^3 \text{ lines/cm}$. Find the angles at which one would observe the first-order maximum, the second-order maximum, and so forth. 4

5. (a) State and explain Brewster's law. Show that at the polarizing angle of incidence, the reflected and refracted rays are mutually perpendicular to each other. 5
- (b) Explain polarization of light by selective absorption, and hence the Malus law. 5
- (c) Unpolarized light is incident upon three polarizers. The first polarizer has a vertical transmission axis, the second has a transmission axis rotated 30° with respect to the first, and the third has a transmission axis rotated 75° relative to the first. If the initial light intensity of the beam is I_b , calculate the light intensity after the beam passes through (i) the second polarizer, and (ii) the third polarizer. 4
6. (a) What is fission reactions? How does fission reactions occurs? 3
- (b) Define spontaneous and induced fission. 2
- (c) Write down the important characteristics of fission reactions. Write down short notes on each characteristic. 5
- (d) Calculate excitation energy in fission process. Sketch a diagram for surface energy and Coulomb repulsion between the fission fragments those produce a potential barrier. 4
7. (a) Define effective neutron multiplication factor (k). Explain subcriticality, criticality and supercriticality with the value of k . 4
- (b) What is nuclear reactors? Write down the types of nuclear reactors. Briefly discuss the sodium cooled fast reactor with schematic diagram. 6
- (c) How does a nuclear power plant works? Briefly discuss its advantages and disadvantages. 4

Patuakhali Science and Technology University

Faculty of Computer Science and Engineering

2nd Semester (L-I, S-II) Final Examination of B.Sc.Engg.(CSE), July- December-20, Session:2019-20.

Course Code: MAT-121 Course title: Mathematics-11

Credit Hour: 3.0 Full marks: 70 Time: 3.0 hours

[Figure in the right margin indicates full marks. Split answering of any question is not recommended.]

Answer any 5 of the following questions.

- 1. a)** Define Cofactor of matrix, Adjoint of a square matrix and inverse matrix. 3

- b)** Find the inverse of the matrix 5

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 0 & -1 \\ 3 & 3 & 2 \end{bmatrix}$$

- c)** Solve the system of equations by using matrix method 6

$$x + 2y + 4z = 8$$

$$2x + y + 2z = 5$$

$$5x + y + z = 7$$

$$\begin{array}{c} \vec{a} \times \vec{b} \\ \hline \vec{a} \times \vec{b} \end{array}$$

- 2. a)** Define Characteristics Matrix, Characteristics Polynomial and Characteristics equation. 3

- b)** Find all eigen values and all associated eigen vectors of the following 7

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & -5 & 3 \\ 6 & 0 & 4 \end{bmatrix}$$

- c)** Find the value of p so that the vectors $2\vec{i} - \vec{j} + \vec{k}$, $\vec{i} + 2\vec{j} - 3\vec{k}$ and $3\vec{i} + p\vec{j} + 5\vec{k}$ are coplanar. 4

- 3. a)** Divergence, Curl and line integral. 3

- b)** State Stoke's theorem. 2

- c)** If $\vec{F} = (2x^2 + y^2)\vec{i} + (3y - 4x)\vec{j}$, evaluate $\int_C \vec{F} \bullet d\vec{r}$ around the triangle ABC whose vertices 5

are A(0,0); B(2,0); C(2,1).

- d)** Determine a unit perpendicular to the plane of \vec{a} and \vec{b} where $\vec{a} = 4\vec{i} + 3\vec{j} - \vec{k}$ and 4
 $\vec{b} = 2\vec{i} - 6\vec{j} - 3\vec{k}$. Also obtain sine of the angle between \vec{a} and \vec{b} .

- 4. a)** Find the change in the coordinates of a point when the origin is shifted to another point O 5
 (α, β) where the direction of axes remains unaltered.

- b)** Define the invariants of transformations. Transform the equation $x^2 - 6x + 2y^2 + 7 = 0$ 4
through the new origin (3,1).

- c)** Determine the equation of parabola $x^2 - 2xy + y^2 + 2x - 4y + 3 = 0$ after rotating of axes 5
through 45° .

- 5. a)** Find the condition that the general equation of the second degree $ax^2 + 2hxy + by^2 +$ 6
 $2gx + 2fy + c = 0$.

- b) Derive the equation of bisectors of the angles between the straight lines of the equation $ax^2 + 2hxy + by^2$. 4
- c) If the pair of straight line $x^2 - 2axy - y^2 = 0$ and $x^2 - 2bxy - y^2 = 0$ be such that each pair bisects the angle between other pair, prove that $ab = -1$ 4
6. a) If l and l' are the lengths of the segments of any focal chord of the parabola $y^2 = 4ax$ prove that $\frac{1}{l} + \frac{1}{l'} = \frac{1}{a}$ 7
- b) Find the standard equation of Hyperbola with geometrical configuration 7

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]
Answer any 5 of the following questions.

- 1. a)** Complete the summary using the words or phrases from the following Reading Passage: 5.0

Many people have cried, laughed or been startled while watching a movie. This is because their brains process and react to the sensory input as if it were happening to them. This same type of engagement is possible when a person plays a video game.

While gaming, a gamer's brain is processing the scenario as if it were real. If the game depicts a dangerous or violent situation, the gamers' bodies react accordingly. Their fight-or-flight response to that perceived danger is triggered by exposure to intense stimulation and violence in the game. Excessive video game use can lead to the brain being revved up in a constant state of hyperarousal.

Hyperarousal looks different for each person, and it can include difficulties with paying attention, managing emotions, controlling impulses, following directions and tolerating frustration. Some adults or children struggle with expressing compassion and creativity, and have a decreased interest in learning. This can lead to a lack of empathy for others, which can lead to violence. Also, kids who rely on screens and social media to interact with others typically feel lonelier than kids who interact in person.

Chronic hyperarousal can have physical symptoms, as well, such as decreased immune function, irritability, jittery feelings, depression and unstable blood sugar levels. In children, some can develop cravings for sweets while playing video games. Combined with the sedentary nature of gaming, children's diet and weight can be negatively affected, as well. Sometimes children will even avoid stopping the game to go to the restroom, which can lead to hygiene issues.

When the brains (i)___ to the sensory input during watching movies, people outburst their emotions. Excessive video game can cause hyperarousal for the acute (ii)___ in the game. Hyperarousal (iii)___ different for each person, and it leaves different difficulties for different people. For Chronic hyperarousal children may develop (iv)___ sweets at the time of video games. They can be negatively (v)___ in terms of diet and weight.

- b)** Discuss IPA with its significance. 5.0
- c)** Transcribe the following words using IPA symbols: (any four) 4.0
 Shine, Man, Loud, Bird, No, Fall
- 2. a)** Discuss the differences between Sidewise and Upward Communication in an organization. 4.0
- b)** How is informal speaking different from formal speaking? Delineate the three main aspects of effective speaking. 6.0
- c)** Elucidate the during and after reading stages along with some activities. 4.0
- 3. a)** Amend the statements if there is any error. 5.0
- i. She made the baby to take a nap.
 - ii. I want to get the house painting before winter.
 - iii. Tom had a tooth fill
 - iv. I like the way you had the beautician done your hair.
 - v. Don't you help each other the study for tests?

- b) Define linking words. Describe the functions of linking words incorporating appropriate examples. 2+3
- c) What do you think can be the writing techniques of good introduction, good description and good conclusion? 4.0
4. a) What is Communication? Interpret the functions of Communication. 3+3
b) Describe different types of communication with examples. 4.0
c) Illustrate the essential conditions of successful communication. 4.0
5. a) Make a comparative study on the reading techniques including Scanning Skimming, Inference and Reference. 5.0
b) Enumerate the Do's and Do'ts of an oral presentation. 2.0
c) Prepare a CV along with the cover letter applying for the post of a 'Information Technology Officer' to Meghna Group of Industries Ltd advertised in the *Daily Picture* of 30 May, 2022. 7.0
6. a) Write an essay on the following topics (*any one*): 14.0
i. Causes, Effects and Remedies of Environment Pollution
ii. Boons and banes of Social Media in modern time.
iii. The role of Information Technology in reducing Unemployment Problem