

PART II (GSA)

SECTION - I

Q2.

- (a) Differentiate between a star and a Planet. Briefly describe lifecycle of a Nebula to Black Hole.

STAR:

A star is a massive, luminous sphere of plasma, primarily hydrogen and helium, that generates its own light and heat through the process of nuclear fusion in its core.

The large gravitational force within a star creates the pressure and temperature that is necessary to sustain this fusion reaction, that makes the star a self-luminous and long-lived.

PLANET:

A planet is a celestial body that orbits a star but does not produce light through any kind of reaction. A planet is comparatively less smaller than the star and reflects light from the star (Sun) rather than generating on its own.

Therefore, stars are power house of the solar system, while planets are non-luminous bodies in their orbit.

LIFECYCLE OF A STAR:

A star's life starts as a nebula that is a cloud of dust and gases, the gravity forms a protostar and then nuclear fission reaction ignites in it that burns hydrogen turning it into a main sequence star.

For massive stars, fuel runs out, hydrogen depletes, the star expands and cool dramatically showing it as big "Red Supergiant", and then the core becomes a dense neutron star, collapses, triggering a massive explosion, scattering heavy elements. This process is called **Super Nova** and turns it into a "Black Hole" where gravity is as dense as point of infinity and traps the light in it.

Q2(b) What are semi-conductors? Explain the difference between n-type and p-type semi-conductors and list two of their modern applications

SEMI-CONDUCTORS:

The materials with conductivity between conductors and insulators are called semi-conductors. Their ability of conducting electricity can be precisely controlled and they act as a bridge between conductors and insulators.

N-Type Semi-conductors:

These semi-conductors have negative carriers (electrons) in majority and positive in minority.

P-Type Semi-conductors:

In contrast, p-type has holes (positive carriers) in majority and less negative carriers in them.

MODERN APPLICATIONS:

SOLAR PANELS:

N-type and P-type semi-conductors are used in solar panels, it forms a P-N junction that converts

light energy into electricity with much greater efficiency.

Q2 (c) Define Global Warming.
Explain the difference/mechanism of the Greenhouse Effect and list three major greenhouse gases.

GLOBAL WARMING.

Global Warming is long-term of the Earth. Basically, it is heating of the Earth's climate system that is observed since the pre-industrial period which was between 1850 and 1900 and until today that has happened due to human activities like fossil fuel burning, that increases the gases that trap heat in the Earth's atmosphere.

MECHANISM OF GREEN HOUSE

EFFECT:

The green house effect is basically a natural process that warms the Earth's surface and

atmosphere to provide enough energy for life to exist in this planet. Without this, Earth would become ice cold and life would be impossible on it.

The mechanism of the green house effect works as follows:

SOLAR RADIATION:

The sun emits the solar radiation that passes through the Earth's atmosphere.

HEAT RADIATION OUT:

The surface that was warmed due to solar radiations radiates the energy back towards space.

TRAPPING BY GASES:

Greenhouse gases in atmosphere absorb some of the infrared radiation and these gases emit the energy in all directions.

WARMING EFFECT OF GASES:

This re-absorption and re-emission process traps heat in the lower atmosphere which lets sunlight in but does not let it escape so it raises the temperature of the Earth.

THREE MAJOR GREEN HOUSE GASES:

1. Carbon Dioxide (CO_2):

Most significant gases caused by human activities

2. Methane (CH_4):

A gas produced by natural sources and human activities

3. Water Vapors (H_2O):

Another abundant gas in the atmosphere

Q2 (d). What is Tsunami? Explain the natural process of that triggers tsunami and the potential impact on coastal areas?

TSUNAMI:

It is a series of long ocean waves that can be caused by any sudden, they are the large displacement of the water that could happen due to geological events near the ocean floor or below it.

NATURAL PROCESS TO TRIGGER TSUNAMI:

1. EARTHQUAKES:

The main natural process to trigger a tsunami is an "Earthquake", when tectonic plates lock and suddenly slip, the seafloor can shake and this vertical movement generates powerful waves that come outwards causing a tsunami.

2. VOLCANIC ERUPTIONS:

Violent volcanic eruptions can also cause great scale of tsunamis displacing significant amount of water.

POTENTIAL IMPACT ON COASTAL AREAS

LOSS OF LIFE:

Tsunamis cause significant loss of human and animal life through drowning and physical trauma through debris.

FLOODING:

Coastal Areas can be inundated several miles inland due to floods.

ENVIRONMENTAL DAMAGE

The high amount

of sea water (salt water) pollutes fresh water resources and destroys ecosystem.
LONG-TERM ECONOMIC IMPACT:

The destruction of ports, tourism places, and agricultural land can shake the local economy for years.

Q5(a) What constitutes a balanced diet? Briefly explain the functions of carbohydrates and proteins in the human body?

BALANCED DIET:

A balanced diet provides the body with all the essential nutrients, it needs to function correctly, grow and repair itself.

It includes a variety of foods in appropriate proportions to ensure the adequate intake of the macronutrients and micronutrients and water intake.

COMPONENTS OF BALANCED DIET

- a) FRUITS AND VEGETABLES
- b) CARBOHYDRATES
- c) PROTEINS
- d) FATS
- e) DAIRY AND STARCHY FOODS

FUNCTIONS OF CARBOHYDRATES:

They are broken down into glucose used for energy production, and fuels the brain as well. They provide fiber that is needed for digestion.

FUNCTIONS OF PROTEINS:

They are used for growth and repair of the body and to create enzymes and antibodies.

Q5(c) Define food preservation. Explain principles behind the Pasteurization and canning as methods to ward off food deterioration.

FOOD PRESERVATION:

It stops spoilage by inhibiting microbes, slowing enzymes and preventing

chemical changes using
pasteurization and canning
allowing for longer storage
and future use while
retaining quality and nutrients

PRINCIPLES OF PASTEURIZATION:

Mild heat
below boiling to kill specific organisms
that cause spoilage and pathogens
killing without altering the food
quality, taste or other nutritional
value.

PRINCIPLES OF CANNING:

High heat
Sterilization of food in cans to
destroy all microorganisms and
enzymes creating a product that
is shelf-stable.

(Q5(c)) What is the Internet of
Things (IOT). How is it transformed
daily life and business? Give
Give 2 real world examples

INTERNET OF THINGS.

It is a network of inter-connected objects or things that are embedded with softwares, sensors and technologies that are used for connection and exchange of data with other systems over the internet.

TRANSFORMATION OF DAILY LIFE:

IoT devices make home smarter. Smart thermostates are installed in the insulation of the house that can adjust temperature automatically in the house for a convenient life. Smart watches also play vital role in this transformation.

TRANSFORMATION OF BUSINESS:

IoT helps the company to operate efficiently. For example retail stores use IoT to manage how much stock is left and set the price of all the material automatically.

REAL WORLD EXAMPLES:

1. SMART HOMES:

A user can use a smart phone to remotely lock doors, view security

camera footage and turn the lights on or off

2. CONNECTED LOGISTICS :

Shipping companies like Leopard or TCS use IOT sensors to track the shipment and find the real-time location of the order.

Q5(d): Differentiate between RAM and ROM. Explain the basic architecture of computer focusing on the CPU and its components (ALU and CU)?

RAM:

RAM stands for "Random Access Memory". It is volatile memory that means it is not permanent, all the data is stored temporarily and is lost when power is cut off.

RAM is fastest memory after cache memory and it is used for the temporary storage for the programs that are running in the computer while the power is on.

ROM:

ROM stands for "Read Only Memory". It is non-volatile memory that means it is not changeable. It is used for permanent storage of the data that means data will be stored in it even when the power is cut off.

Because it is just read only memory, it is much slower than RAM and data can only be written once in it and then it becomes permanent.

BASIC COMPUTER ARCHITECTURE:

The fundamental architecture is also known as

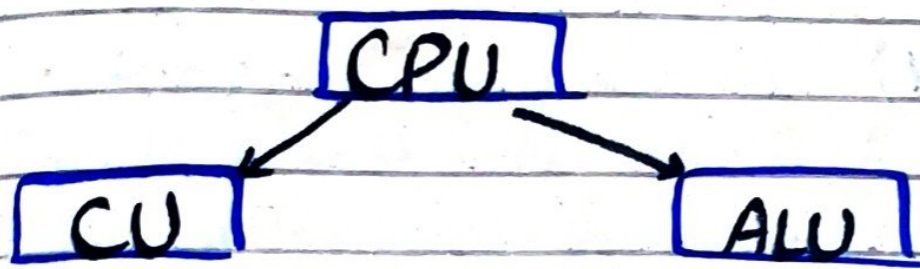
"Von-Neumann Architecture" and it has 4 primary components.

1. CPU (Central Processing Unit)
2. Memory (RAM & ROM)
3. Input devices (mouse, keyboard, microphone)
4. Output devices (monitor, speaker, printer)

FOCUS ON CPU:

CPU is called "brain" of the computer and it

executes instructions from programs in RAM



ARITHMETIC LOGIC UNIT:

In ALU, CPU performs all arithmetic and logic operations.

ARITHMETIC OPERATIONS:

It handles basic mathematical calculations.

LOGIC OPERATIONS:

It handles comparisons and logical decisions such as $<$, $>$, AND, OR etc.

CONTROL UNIT:

CU is component that directs the operations within CPU and entire computer system. It acts as manager and manages:

- 1) Timing and Control
- 2) Component Management
- 3) Instruction decoding

SECTION II

Q7(a) In survey of 100 people, 65 watch cricket, 40 watch Hockey, 20 watch neither. How many people watch both?

SOL: Total people = 100

People watching hockey = 65

People watching Cricket = 40

People watching nothing = 20

①

People watching at least one sport $100 - 20 = 80$

$= |C \cup H|$

②

Principle of inclusion - exclusion

$$|C \cup H| = |C| + |H| - |C \cap H|$$

$$|C \cap H| = |C| + |H| - |C \cup H|$$

$$= 65 + 40 - 80$$

$$|C \cap H| = 25 \rightarrow \text{Both sports}$$

Q7(b)

A rectangular swimming pool has length of 4 meters more than its width.

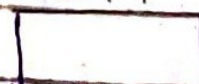
If perimeter of pool is 72 meters, what is vol of water needed to fill pool to uniform depth of 2.5 meters

length = 4 + width

width = w

$w + 4$

w



$$\text{Perimeter} = 2(L + W)$$

$$72 = 2(w + 4 + w)$$

$$72 = 2(2w + 4)$$

$$72 = 4W + 8 \Rightarrow 72 - 8 = 4W$$

$$64 / 4 = W \Rightarrow W = 16 \text{ meters}$$

$$\text{Length} = 4 + 16 = 20 \text{ meters}$$

AREA: $L \times W$

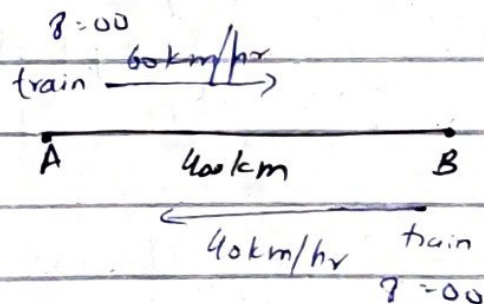
$$A = 20 \text{ m} \times 16 \text{ m} = 320 \text{ m}^2$$

VOL: -

Q7(c) A train leaves city A at 8:00 AM travelling at 60 km/hr. Another train leaves city B at same time towards City A at 40 km/hr. If distance between A & B is 400 km, at what time will the 2 trains meet

$$V_A = 60 \text{ km/hr}$$

$$V_B = 40 \text{ km/hr}$$



$$\text{Velocity} = \frac{\text{distance}}{\text{time}}$$

$$\text{Time}_A = \frac{\text{distance}}{V_A} = \frac{400}{60} = \frac{20}{3} \text{ hr}$$

$$\text{Time}_B = \frac{\text{distance}}{V_B} = \frac{400}{40} = 10 \text{ hr}$$

$$\text{Time}_A + \text{Time}_B = \frac{20}{3} + 10$$

$$= \frac{20 + 30}{3} = \frac{50}{3} \text{ hr}$$

Q7(d) The sum of present ages of father and his son is 75 years.

Ten years ago, the father's age was 4 times the son. What are their current ages?

Let father age = x

Son age = y

Ten years ago

$$-10 + x = 4(y - 10)$$

$$x - 10 = 4y - 40$$

$$x - 10 = 4y - 40$$

$$x - 4y - 10 + 40 = 0$$

$$x - 4y + 30 = 0$$

$$\boxed{x = 4y - 30} \quad \text{--- (1)}$$

present

$$x + y = 75$$

$$\boxed{x = 75 - y}$$

(2)

Put (1) in (2)

$$x = 75 - y$$

$$4y - 30 = 75 - y$$

$$4y + y - 30 - 75 = 0$$

$$5y - 105 = 0$$

$$y = \frac{105}{5}$$

son

$$\boxed{y = 21 \text{ years}}$$

$$x + y = 75$$

$$x + 21 = 75$$

$$x = 75 - 21$$

Father

$$\boxed{x = 54 \text{ years}}$$

Q9(a)

In a certain code language
if ROAD is coded as UQDG how
would LAKE be coded in same

language? Explain rule of coding

A	B	C	D	E	F	G
1	2	3	4	5	6	7
H	I	J	K	L	M	N
8	9	10	11	12	13	14
O	P	Q	R	S	T	U
15	16	17	18	19	20	21
V	W	X	Y	Z		
22	23	24	25	26		

$$R = 18 + 3 = 21 \rightarrow U$$

$$O = 15 + 3 = 18 \rightarrow R$$

$$A = 1 + 3 = 4 \rightarrow D$$

$$D = 4 + 3 = 7 \rightarrow G$$

So

$$L = 12 + 3 = 15 \rightarrow O$$

$$A = 1 + 3 = 4 \rightarrow D$$

$$K = 11 + 3 = 14 \rightarrow N$$

$$E = 5 + 3 = 8 \rightarrow H$$

So LAKE $\rightarrow$ ODNH

Q3(b) A man tells a woman,
"The son of my sister's husband is
father of your son" How is the
woman related to man?

→ My sister's husband = man's
brother in law

→ Son of my sister's husband =
(sister's son) man's nephew

→ "Is father of your son" =
man's nephew is father of
woman's son

So,

→ man's nephew = woman's husband

→ woman = man's nephew wife

Woman = daughter-in law
(indirectly)
of man

Q3(c): Find the next number in
each of the following sequences and
explain its pattern.

(i) 4, 12, 6, 18, 9, 27, —

Ans

4, +2, 6, +3, 9, +4

$$9 + 4.5 = 13.5$$

$3 \times 4 = 12$, $3 \times 6 = 18$, $3 \times 9 = 27$, —

So,

4, 12, 6, 18, 9, 27, 13.5

$\frac{12}{2} = 6$
$\frac{18}{2} = 9$
$\frac{27}{2} = 13.5$

(ii) 1, 2, 6, 24, 120, 720

$$1 \times 2 = 2$$

$$2 \times 3 = 6$$

$$6 \times 4 = 24$$

$$24 \times 5 = 120$$

$$120 \times 6 = 720$$

The next number is 720

Q8(d). Five 5 friends (P, Q, R, S, T) have diff heights

- P is shorter than Q but taller than R
- S is shorter than T but taller than Q
- The shortest person is 150 cm tall, the tallest is 180 cm. Who among the friends is the third tallest?

and what is max possible range?

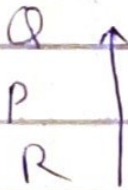
their heights?

Total friends = 5

P, Q, R, S, T

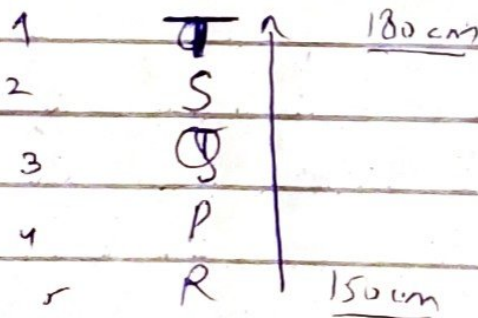
— P is shorter than Q but taller than R

Tallest 180cm



shortest 150cm

→ S is shorter than T but taller than Q



→ Who among them is 3rd tallest
The third person is **Q**

→ Max Range possible

Shortest = 150cm

Tallest = 180cm

Range = 180 - 150

30cm