SHIKSHA CLASSES

Subject : Science -I **Answer Paper** **Marks : 20**
Class : X **10. Space mission**

Q.1: A) Choose the correct alternative : 2

1) The first person to go into the space in a spacecraft was

Ans: b) Yuri Gagarin

2) A group of students from COEP made a small satellite namely.

Ans: d) Swayam

B) Solve the following questions. (Any One) 1

1) Write true or false.

The escape velocity on moon is less than that on earth.

Ans: True

2) Name the first artificial satellite.

Ans: 'Sputnik' is the first artificial satellite.

3) Complete the analogy.

Ans: INSAT : Communication satellite :: **IRS** : Earth observational satellite

Q.2: A) Give scientific reason. (Any One) 2

1) Geosynchronous satellite appears to be stationary with respect to earth.

Ans: i) The earth takes almost 24 hrs for one rotation around itself.

ii) If a satellite is revolving in an orbit parallel to equator the time of rotation of earth around itself and that for satellite to revolve round the earth is same.

iii) Also the orbit of rotation is circular and its angular velocity is identical to that of earth.

iv) Also these satellite revolve in same direction as earth rotates i.e. from west to east.

v) Hence for an observer on the surface of the earth, the satellite appears to be stationary.

2) It is very essential to manage the space debris.

Ans: i) In addition to artificial satellite some objects like non functional satellite parts of launches detached and debris are generated due to collision of one satellite with other satellite or any other object in space.

ii) These object revolve around the earth and can be harmful to artificial satellite.

iii) It can collide with artificial satellites or spacecrafts and damage them.

iv) These are increasing day by day and thus it will be difficult to launch new spacecrafts.

B) Solve the following question (Any Two) 4

1) What is the need of space mission?

Ans: We need space missions as we :

i) Can contact a person in any part of the world within a second.

ii) Can gather information about worldwide events sitting at home.

2) Why it is beneficial to use satellite launch vehicles made of more than one stage?

Ans: The vehicle has to carry a large weight of the fuel with it. To over come this problem, launch vehicles with more than one stage are used. Due to this the weight of the vehicle can be reduced step by step after its launching therefore it is beneficial to use satellite launch vehicles made of more than one stage.

3) Write the difference between HEO and MEO

Ans:

HEO	MEO
1) Height of satellite in HEO is greater than or equal to 35780 km.	1) Height of satellite in MEO is in between 2000 km and 35780 km
2) These are not useful in study of polar region	2) These are useful in study of polar regions.
3) These orbits complete one revolution in almost 24 hrs.	3) These orbits complete one revolution in 2 to 24 hrs.
4) These satellite appears to be stationary and hence are called geosynchronous	4) These satellites revolve with different velocities and hence do not appear stationary.

4) If mass of a planet is eight times the mass of the earth and its radius is twice the radius of the earth. What will be the escape velocity for that planet?

Ans: $M_P = 8\ M_e$

$R_P = 2\ R_e$

Vesc (Planet) = ?

$$Vesc = \sqrt{\frac{2GM}{R}}$$

$$(Vesc)_P = \sqrt{\frac{2GM_p}{R_P}} = \sqrt{\frac{2G(8M_e)}{2(R_e)}} = \sqrt{\frac{8GM_e}{R_e}}$$

$$\frac{(Vesc)_e}{(Vesc)_p} = \frac{\sqrt{\frac{2GM_e}{R_e}}}{\sqrt{\frac{8GM_e}{R_e}}} = \frac{\sqrt{2}}{\sqrt{8}} = \frac{\sqrt{2}}{\sqrt{1\times 4}}$$

$$\frac{(Vesc)_e}{(Vesc)_p} = \frac{1}{2}$$

Escape velocity of earth = 11.2 km/s

$$\frac{11.2}{(Vesc)_p} = \frac{1}{2}$$

$(Vesc)_p = 2 \times 11.2 = 22.4$ km/s

$\therefore$ The escape velocity of planet is 22.4 km/s.

Q.3: Answer the following questions (Any Two) 6

1) Write a short note on India and space technology.

Ans: i) India has developed various types of launch vehicles to put satellites having weight upto 2500kg. into all types of orbits.

ii) PSLV & GSLV are two important launchers.

iii) INSAT & GSAT satellite series is actively working in the field of telecommunication, television broadcasting & meteorological services.

2) Explain mars missions in brief.

Ans: ISRO's performance in this mission is remarkable & we all must be proud of it.

The spacecraft 'Mangalyaan' made by ISRO using minimum expences was launched in November, 2013 & was placed into orbit around the Mars in September, 2014. It Obtained very useful information about the space of the mars & the atmosphere around it

3) Why are geostationary satellites not useful for the studies of polar regions?

Ans: i) The geostationary satellites orbit the equator.

ii) These are, therefore, not useful in the study of polar regions.

iii) for this purpose, elliptical medium earth orbits passing over the polar region are used.

4) Derive the equation of critical velocity of a satellite. What do you conclude from the equation.

Ans: If a satellite of mass m is revolving around the earth in an orbit of height h with speed 'V_c' then force acting on its centripetal force given by mv_c^2 where r is the orbital radius of satellite from centre of earth. This centripetal force is provided by the gravity of the earth

$\therefore$ Centripetal force = gravitational force between earth and satellite

$$\frac{mv_c^2}{R+h} = \frac{GMm}{(R+h)^2}$$

$$mv_c^2 = \frac{GM}{R+h}$$

$$v_c = \sqrt{\frac{GM}{R+h}} \quad \text{..... (1)}$$

G = Gravitational constant

M = Mass of earth

R = Radius of earth

h = height of satellite above earth surface

R + h = Radius of orbit of satellite

From equation (1) we conclude that the critical velocity does not depend on mass of satellite. As the height of satellites orbit from the earth's surface increases, the critical velocity decreases.

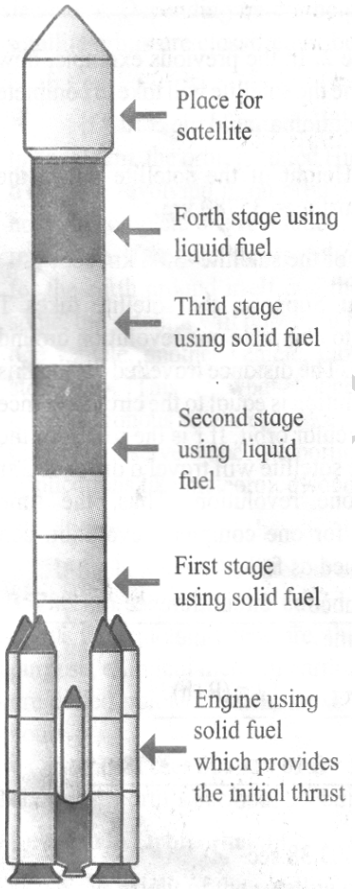
Q.4: Solve the following question (Any One) 5

1) What is meant by satellite launch vehicles? Explain a satellite launch vehicle developed by ISRO with the help of a schematic diagram.

Ans: i) Satellite launch vehicles are used to place the satellites in their specific orbits. These vehicles consist of different stages.

ii) The fuel and engine in the first stage are used. This imparts a specific velocity to the vehicles & takes it to a certain height.

iii) Engine & empty fuel tank gets detached & then fuel in the next stages are ignited one by one resulting into reduction in the weight & increase in the speed.



Structure of PSLV made by ISRO

2) Explain the different types of satellites and their functions along with the names of Indian satellite series and their launch vehicles.

Ans:

Type of Satellite	**Function of the satellite**	**Names of Indian satellite series & their launch vehicles**
1) Weather Satellite	Study & prediction of weather	INSAT & GSAT Launcher GSLV.
2) Communication Satellite	Establish communication between different location in the world through use of specific wavers.	INSAT & GSAT launcher : GSLV

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