Module – 5

FLAPPING AND ROTARY WING FLIGHT, SPACE FLIGHT, ROCKET FLIGHT

Syllabus:

Flapping and Rotary Wing Flight, Space Flight, Rocket Flight

MCQs

1. How does flapping contribute to lift in birds and insects?

a) It generates thrust

b) It creates vortices

c) It produces oscillations

d) It generates lift

2. Which of the following best describes autorotation in helicopters?

a) Controlled descent without engine power

b) Vertical takeoff and landing

c) Continuous rotation of the main rotor

d) Rapid horizontal flight

3. What is the main advantage of a coaxial rotor system in helicopters?

a) Increased stability

b) Higher speed capability

c) Enhanced maneuverability

d) Simplified controls

4. Which rotary-wing aircraft is known for its use in medical evacuations and search-and-rescue operations?

a) Chinook

b) Apache

c) Black Hawk

d) Osprey

5. The cyclic control in helicopters is used to adjust what?

a) Engine power

b) Collective pitch

c) Roll

d) Pitch and roll

6. What is the minimum velocity required to achieve orbit around the Earth?

a) Escape velocity

b) Terminal velocity

c) Orbital velocity

d) Launch velocity

7. Which famous space telescope has provided valuable insights into distant galaxies and nebulae?

a) Voyager

b) Hubble

c) Kepler

d) Curiosity

8. What is the term for the point during a space mission where gravitational forces cancel out, causing objects to appear weightless?

a) Zero-G point

b) Anti-gravity zone

c) Lagrange point

d) Weightlessness apex

9. Which of the following is not a type of space mission?

a) Manned mission

b) Robotic mission

c) Satellite mission

d) Lunar eclipse mission

10. What is the primary purpose of a space probe?

a) To study celestial bodies from close proximity

b) To transport astronauts to space stations

c) To repair and maintain satellites

d) To launch satellites into orbit

11. What principle is used in rocket propulsion to achieve thrust?

a) Aerodynamics

b) Gravitational pull

c) Conservation of momentum

d) Electrostatics

12. Which of these is a critical factor affecting rocket efficiency?

a) Rocket's color

b) Rocket's size

c) Exhaust velocity

d) Rocket's age

13. The "Tsiolkovsky rocket equation" relates rocket performance to which factor?

a) Payload weight

b) Rocket's color

c) Launch location

d) Fuel type

14. What is staging in the context of rocket flight?

a) Rocket's attitude control

b) Rocket's altitude measurement

c) Sequential release of sections during flight

d) Rocket's trajectory prediction

15. Which rocket was used for the Apollo program that landed humans on the Moon?

a) Falcon 9

b) Delta IV

c) Saturn V

d) Atlas V

16. What is the primary purpose of feathering in a helicopter rotor?

a) To increase lift

b) To reduce drag

c) To control pitch

d) To increase stability

17. Which phenomenon is responsible for the "ground effect" experienced by helicopters close to the ground?

a) Reduced lift due to turbulence

b) Increased lift due to compression of air

c) Increased lift due to reduced vortices

d) Reduced lift due to increased atmospheric pressure

18. The main difference between flapping flight and fixed-wing flight is:

a) The type of propulsion used

b) The shape of the wings

c) The method of lift generation

d) The altitude at which they operate

19. In the context of rotorcraft, what is "retreating blade stall"?

a) A maneuver to increase altitude

b) A loss of lift on the advancing blade

c) A technique for hovering

d) A method to reduce rotor noise

20. Which of the following is an advantage of a quadcopter's design over a traditional helicopter?

a) Greater stability

b) Higher top speed

c) Larger payload capacity

d) Longer range

21. What is the International Space Station's primary purpose?

a) Planetary exploration

b) Space tourism

c) Scientific research and experiments

d) Space mining

22. What term describes the trajectory that enables a spacecraft to travel from Earth to another celestial body?

a) Transfer orbit

b) Escape path

c) Tangential trajectory

d) Orbital pathway

23. What is the purpose of the heat shield on a spacecraft during reentry?

a) To reflect sunlight

b) To prevent collisions with debris

c) To dissipate excess heat

d) To protect against atmospheric friction

24. What was the name of the first artificial satellite launched into orbit by humans?

a) Apollo 11

b) Sputnik 1

c) Hubble Space Telescope

d) Voyager 1

25. Which space agency successfully landed the Perseverance rover on Mars in 2021?

a) NASA

b) ESA (European Space Agency)

c) Roscosmos

d) ISRO (Indian Space Research Organisation)

26. What type of propulsion system do most modern rockets use?

a) Steam power

b) Electric propulsion

c) Chemical propulsion

27. What role do fins play in the design of a rocket?

a) Enhancing aerodynamic stability

b) Increasing payload capacity

c) Reducing fuel consumption

d) Providing communication links

28. Which principle is used to explain how rockets can operate in the vacuum of space?

a) Conservation of momentum

b) Bernoulli's principle

c) Newton's first law of motion

d) Archimedes' principle

29. Which space agency developed the Saturn family of rockets, including the Saturn V used in the Apollo program?

a) NASA

b) Roscosmos

c) ESA

d) CNSA (China National Space Administration)

30. What is the term for the minimum velocity required for a rocket to escape Earth's gravitational influence entirely?

a) Launch velocity

b) Orbital velocity

c) Escape velocity

d) Terminal velocity

31. The cyclic control in helicopters is used to control:

a) Engine power

b) Pitch and roll

c) Yaw

d) Altitude

32. The tail rotor in helicopters serves the purpose of:

a) Providing forward thrust

b) Balancing the main rotor torque

c) Generating lift

d) Reducing drag

33. Which of the following statements about autorotation in helicopters is true?

a) It requires engine power for descent

b) It is used during takeoff

c) It involves constant rotation of the rotor

d) It is a controlled descent without engine power

34. What is the main purpose of the swashplate mechanism in a helicopter?

a) To adjust the pitch of the tail rotor

b) To control the cyclic pitch of the main rotor blades

c) To provide stability during hovering

d) To control the yaw of the helicopter

35. What is the main advantage of a tandem rotor configuration in helicopters?

a) Improved maneuverability

b) Reduced mechanical complexity

c) Increased lift efficiency

d) Enhanced speed capabilities

36. The region beyond Earth's atmosphere where gravity from the Earth and Sun cancels out, creating stable points for satellite placement, is called:

a) Escape zone

b) Lagrange point

c) Van Allen belt

d) Hohmann transfer orbit

37. Which space agency successfully landed the Chang'e-4 rover on the far side of the Moon?

a) NASA

b) ESA

c) CNSA

d) Roscosmos

38. Which space telescope was designed to study gamma-ray emissions from celestial sources?

a) Chandra X-ray Observatory

b) James Webb Space Telescope

c) Spitzer Space Telescope

d) Fermi Gamma-ray Space Telescope

39. The process of using a planet's gravity to alter a spacecraft's trajectory is called:

a) Gravity assist

b) Orbital resonance

c) Centrifugal acceleration

d) Tidal locking

40. What is the term for a space station's orbit that keeps it in the same position relative to a specific location on Earth's surface?

a) Polar orbit

b) Low Earth orbit

c) Geostationary orbit

d) Heliocentric orbit

41. The force that propels a rocket forward is known as:

a) Centrifugal force

b) Thrust

c) Drag

d) Lift

42. Which of the following is a type of rocket propulsion that does not require an external source of oxygen?

a) Solid rocket

b) Liquid rocket

c) Hybrid rocket

d) Ion thruster

43. The payload of a rocket is:

a) The fuel used for propulsion

b) The astronauts on board

c) The scientific instruments or cargo carried

d) The outer shell of the rocket

44. What is the process of venting excess pressure or gas from a rocket's engines during launch?

a) Throttling

b) Deorbit burn

c) Transposition and docking

d) Pressure relief

45. The Delta IV Heavy and Falcon Heavy are examples of:

a) Intercontinental ballistic missiles

b) Single-stage rockets

c) Heavy-lift launch vehicles

d) Reusable spaceplanes

46. Which bird is known for its ability to hover in mid-air using rapid wing flapping?

a) Bald eagle

b) Peregrine falcon

c) Albatross

d) Hummingbird

47. The angle between the chord line of an airfoil and the oncoming airflow is known as:

a) Angle of attack

b) Pitch angle

c) Dihedral angle

d) Yaw angle

48. The phenomenon of vortex ring state occurs when a helicopter:

a) Experiences a tail rotor failure

b) Flies too fast for its rotor system

c) Flies too slowly and experiences excessive descent rate

d) Encounters a strong crosswind

49. Which type of rotor configuration is commonly used in gyrocopters?

a) Tandem rotor

b) Coaxial rotor

c) Single main rotor with tail rotor

d) Autogyro rotor

50. Which factor primarily determines the lift produced by a rotary wing aircraft?

a) Engine power

b) Airspeed

c) Rotor blade material

d) Altitude

51. The term "orbital inclination" refers to:

a) The angle between a spacecraft's orbit and the equator

b) The curvature of a rocket's trajectory

c) The time it takes for a satellite to complete one orbit

d) The point in the orbit closest to the Earth

52. Which space agency successfully landed the Chang'e-5 mission to collect lunar samples and return them to Earth?

a) NASA

b) CNSA

c) ESA

53. The space probe "Voyager 1" is famous for:

a) Landing on Mars

b) Exploring the asteroid belt

c) Being the first human-made object to enter interstellar space

d) Studying the atmosphere of Jupiter

54. The "Great Red Spot" is a prominent feature of which planet in our solar system?

a) Venus

b) Saturn

c) Neptune

d) Jupiter

55. What is the process of using a planet's atmosphere to slow down and enter orbit?

a) Ionization

b) Aerobraking

c) Gravitational assist

d) Atmospheric ignition

56. The main disadvantage of solid rocket motors compared to liquid propellant rockets is:

a) Slower burn rate

b) Limited controllability

c) Shorter thrust duration

d) Higher cost

57. Which stage of a multistage rocket is jettisoned first during launch?

a) Second stage

b) Third stage

c) Payload fairing

d) First stage

58. The "Delta-v" (change in velocity) is a measure of a rocket's:

a) Maximum speed

b) Total distance traveled

c) Payload capacity

d) Total energy

59. The process of venting gas or propellant to control a rocket's trajectory is known as:

a) Thrusting

b) Vortex shedding

c) Attitude control

d) Thrust vectoring

60. Which space agency developed the Long March family of rockets?

a) NASA

b) ESA

c) Roscosmos

d) CNSA

61. Which term describes the sideways motion of a helicopter?

a) Yaw

b) Roll

c) Pitch

d) Hover

62. What is the primary advantage of a coaxial rotor system over a single main rotor with tail rotor configuration?

a) Increased stability

b) Higher speed capability

c) Greater payload capacity

d) Improved fuel efficiency

63. What is the purpose of the tail rotor in a helicopter?

a) To provide lift

b) To counteract main rotor torque

c) To control pitch

d) To enhance forward thrust

64. Which factor plays a crucial role in determining a helicopter's maximum achievable altitude?

a) Engine power

b) Rotor diameter

c) Payload weight

d) Altitude of takeoff

65. What type of flight maneuver involves a helicopter turning about its vertical axis?

a) Roll

b) Pitch

c) Yaw

d) Flap

66. The "Goldilocks zone" refers to the region around a star where conditions are suitable for:

a) Gold mining

b) Binary star systems

c) Planetary habitability

d) Solar flares

67. Which of the following is a type of space debris that poses a threat to operational satellites and spacecraft?

a) Cosmic rays

b) Micrometeoroids

c) Lagrange points

d) Kessler syndrome

68. The process by which a spacecraft enters Earth's atmosphere and slows down to land safely is called:

a) Deorbiting

b) Reentry

c) Escape trajectory

d) Ascension

69. The space probe "Cassini-Huygens" was sent to study which planet and its moon?

a) Mars and Phobos

b) Venus and Titan

c) Jupiter and Europa

d) Saturn and Titan

70. What is the term for the trajectory that takes a spacecraft directly from Earth to another celestial body without intermediate orbits?

a) Escape orbit

b) Hohmann transfer orbit

c) Free-return trajectory

d) Direct ascent trajectory

71. Which type of rocket engine works by expelling gas at high velocities to generate thrust?

a) Steam engine

b) Pulse jet engine

c) Ramjet engine

d) Rocket engine

72. Which of the following factors is critical for achieving a higher exhaust velocity in a rocket engine?

a) Higher fuel mass

b) Higher engine temperature

c) Larger rocket size

d) Lower fuel pressure

73. The specific impulse of a rocket engine is a measure of its:

a) Maximum speed

b) Thrust-to-weight ratio

c) Fuel efficiency

d) Altitude capability

74. What is the term for the process of aligning a rocket's propulsion system to control its direction?

a) Attitude control

b) Thrust vectoring

c) Roll control

d) Gimbaling

75. The Indian space agency ISRO developed which satellite launch vehicle?

a) Ariane

b) GSLV (Geosynchronous Satellite Launch Vehicle)

c) Falcon Heavy

d) Long March

76. Which type of rotor configuration is often used in tandem-rotor helicopters like the Boeing CH-47 Chinook?

a) Coaxial rotor

b) Tandem rotor

c) Single main rotor with tail rotor

d) Quadcopter rotor

77. The angle between a helicopter's main rotor plane and the longitudinal axis of the fuselage is known as:

a) Dihedral angle

b) Pitch angle

c) Angle of attack

d) Roll angle

78. Which phenomenon is responsible for the lifting force generated by a rotating helicopter rotor?

a) Centrifugal force

b) Bernoulli's principle

c) Pressure differential

d) Doppler effect

79. What is the effect of blade flapping in a helicopter rotor system?

a) It generates thrust

b) It controls the yaw of the helicopter

c) It stabilizes the helicopter in forward flight

d) It allows the blades to maintain an optimal angle of attack

80. Which flight control input is responsible for changing the pitch of a helicopter's rotor blades?

a) Collective

b) Cyclic

c) Yaw

d) Throttle

81. The largest moon in our solar system, Ganymede, is a moon of which planet?

a) Jupiter

b) Saturn

c) Neptune

d) Uranus

82. The process of using a spacecraft's propulsion system to slow down and enter orbit around a celestial body is known as:

a) Orbital decay

b) Gravitational assist

c) Aerobraking

d) Retrograde burn

83. Which planet has the longest day, lasting approximately 243 Earth days?

a) Venus

b) Mars

c) Mercury

d) Jupiter

84. The space probe "New Horizons" was sent to study which dwarf planet and its moons?

a) Pluto and Charon

b) Ceres and Vesta

c) Eris and Dysnomia

d) Haumea and Namaka

85. What is the term for the trajectory that allows a spacecraft to return to Earth without using additional propulsion?

a) Orbital decay

b) Free-return trajectory

c) Transfer orbit

d) Escape orbit

86. Which famous scientist developed the concept of a multi-stage rocket for space exploration?

a) Isaac Newton

b) Albert Einstein

c) Konstantin Tsiolkovsky

d) Robert Goddard

87. Which type of propulsion system generates thrust by expelling a high-speed jet of gas at the rear of the rocket?

a) Ion propulsion

b) Solid rocket motor

c) Liquid rocket engine

d) Pulse jet engine

88. Which space agency developed the Soyuz rocket, widely used for human spaceflight?

a) NASA

b) CNSA

c) Roscosmos

d) ESA

89. The term "fairing" in rocket design refers to:

a) The outer shell of the rocket

b) The main propulsion engine

c) The navigation system

d) The payload compartment

90. What is the term for the point in a rocket's trajectory where its speed is at its highest?

a) Apogee

b) Perigee

c) Zenith

d) Velocity apex

91. The principle of "autorotation" is most commonly associated with:

a) Glider flight

b) Helicopter flight

c) Rocket flight

d) Fixed-wing aircraft flight

92. The "retreating blade stall" in a helicopter occurs when:

a) The tail rotor fails

b) The advancing blade loses lift

c) The cyclic control is not functioning

d) The helicopter exceeds its maximum speed

93. The "Coriolis effect" in helicopter flight is related to:

a) The rotation of the Earth

b) The curvature of the rotor blades

c) The altitude of the flight

d) The speed of the engine

94. Which rotary-wing aircraft is widely used for airborne medical evacuation?

a) Apache

b) Chinook

c) Black Hawk

d) Osprey

95. The "swashplate" is a component in helicopters that is primarily responsible for:

a) Engine power control

b) Collective pitch control

c) Roll and yaw control

d) Cyclic pitch control

96. Which space agency successfully landed the Perseverance rover in Jezero Crater on Mars in 2021?

a) NASA

b) ESA

c) Roscosmos

d) CNSA

97. The space probe "Rosetta" and its lander "Philae" were sent to study which comet?

a) Hale-Bopp

b) Halley

c) Tempel 1

d) 67P/Churyumov-Gerasimenko

98. What is the term for the process of a spacecraft gradually moving closer to a target celestial body by performing a series of orbital adjustments?

a) Hohmann transfer

b) Gravity assist

c) Orbital rendezvous

d) Trajectory correction maneuver

99. The James Webb Space Telescope (JWST) is designed to primarily observe:

a) The Moon's surface

b) The outer planets

c) Exoplanets and distant galaxies

d) Earth's atmosphere

100. The concept of a space elevator involves a structure that extends from Earth's surface into space, using:

a) Rockets for propulsion

b) Magnetic levitation

c) Tethers and counterweights

d) Solar sails

101. 1. ISRO was established in which year?

a) 15 August 1949

b) 15 August 1969

c) 15 August 1972

d) None of these

102. What is the full form of ISRO?

a) Indian Scholar Research Organization

b) Indian Space Research Organization

c) Indian Station Research Organization

d) None of these

103. Who is the first chairman of ISRO?

a) Mylswamy Annadurai

b) B. N. Suresh

c) Vikram Sarabhai

d) None of these

104.Where is the headquarters of ISRO?

a) Chennai

b) Mumbai

c) Bengaluru

d) None of these

105. How many satellites are launched by ISRO?

a) 112

b) 101

c) 104

106. Which was the first satellite launched by ISRO?

a) Kalpana-1

b) Bhaskara

c) Aryabhata

d) None of these

107. What is the name of first satellite built by India?

a) Bhaskara

b) Aryabhata

c) Sputnik

d) None of these

108. ISRO will launch India's 3rd mission to moon called _____.

a) Chandrayaan-1

b) Chandrayaan-2

c) Chandrayaan - 3

d) None of these

109. What is full form of GSLV?

a) Geosynchronous Satellite Launch Vehicle

b) Geosynchronous Space Launch Vehicle

c) Geosynchronous Scholars Launch Vehicle

d) None of these

110. How many stages are there in GSLV?

a) 2

b) 5

c) 3

d) None of these

111. What is meant by PSLV?

a) Polar Space Launch Vehicle

b) Polar Satellite Launch Vehicle

c) Polar small Launch Vehicle

d) None of these

112. When was PSLV launched for the first time?

a) 2008

b) 2016

c) 2003

d) None of these

113. How many stages are there in PSLV?

a) 4

b) 3

c) 2

d) None of these

114. What is the full form of ASLV?

a) Augmented Satellite Launch Vehicle

b) Air Satellite Launch Vehicle

c) Augmented Space Launch Vehicle

d) None of these

115. In which place Dr Vikram Sarabhai Space Centre is located?

a) Sriharikota

b) Thiruvananthapuram

c) Bangalore

d) None of these

116. Where is the headquarters of DRDO?

a) Mumbai

b) New Delhi

c) Bangalore

d) None of these

117. The Indian National Committee for Space Research (INCOSPAR) was found in which year?

a) 1969

b) 1966

c) 1962

118. Who is the current chairman of ISRO?

a) K Sivan

b) AS Kiran Kumar

c) S Christopher

d) None of these

119. Thumba Equatorial Rocket Launching Station located in which state?

a) Kerala

b) Andhra Pradesh

c) Karnataka

d) None of these

120. Find the odd one?

a) A. S. Kiran Kumar

b) Dr. K. Radhakrishnan

c) Shri G.Madhavan Nair

d) S Christopher

121. What is the full form of IRNSS?

a) Indian Regional Navigation Satellite System

b) Indian Regional Navigation Solar System

c) Indian Research Navigation Satellite System

d) None of these

122. Who is the chairman of Satish Dhawan Space Centre?

a) S Christopher

b) S. Pandian

c) Satish Dhawan

d) None of these

123. When was launched the Chandrayaan I?

a) 22 October 2008

b) 2 October 2008

c) 22 August 2008

d) None of these

124. Which type of fuel is used by GSLV in its operations?

a) Only liquid fuel

b) Liquid in first stage and solid in second stage

c) Solid in first stage and liquid in second stage

d) None of these

125. The experimental satellite SROSS abbreviation means?

a) Stretched Rohini Satellite Series

b) Space Rohini Satellite Series

c) Super Rohini Satellite Series

d) None of these

126. What is the name of the India's Multi Wavelength Space Observatory?

a) Astrosat

b) Cartosat-2

c) RISAT-1

d) None of these

127. Which one is India's first satellite exclusively used for educational purpose?

a) NISAR

b) EDUSAT

c) INSAT-4CR

d) None of these

128. Who is the father of modern space science in India?

a) Satish Dhawan

b) Vikram Sarabhai

c) apj abdul kalam

d) None of these

129. Which was India's first remote sensing satellite?

a) IRS-1A

b) IRS-1C

c) IRS -1G

d) None of these