SNS COLLEGE OF TECHNOLOGY

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COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF AEROSPACE ENGINEERING

Faculty Name	:	**Dr.A.Arun Negemiya, ASP/Aero**	Academic Year	:	**2025-2026 (Even)**
Year & Branch	:	**I Aerospace**	Semester	:	**II**
Course	:	**23AST101 & Fundamentals of Aerospace Engineering**			

Question Bank

UNIT V – AIRCRAFT INSTRUMENTS

Part A – 2 Marks (20 Questions)

No.	Question	Bloom's Level	Source/Reference
1	Define the standard atmosphere and list its key layers.	R	Anderson, 2011 / Syllabus
2	What is the pitot-static system?	R	Pallet, 2016 / NPTEL
3	List the primary flight instruments (the "six pack").	R	Anderson / GATE AE basics
4	Differentiate between Indicated Airspeed (IAS) and Calibrated Airspeed (CAS).	U	GATE AE ~2018 / Syllabus
5	What is True Airspeed (TAS)? How is it related to EAS?	U	Anderson / NPTEL
6	Define Equivalent Airspeed (EAS).	R	Syllabus
7	State the principle of operation of an Airspeed Indicator (ASI).	U	Pallet, 2016
8	What is a Mach meter? How is Mach number indicated?	U	GATE AE conceptual / Pallet
9	Define pressure altitude and density altitude.	R	Anderson
10	What is the principle of a barometric altimeter?	U	Pallet / Anna Univ patterns
11	List types of errors in altimeter readings (e.g., position, instrument).	R	GATE AE ~2017–2022 / Pallet
12	What is a Vertical Speed Indicator (VSI)? State its principle.	U	NPTEL / Syllabus
13	Differentiate between gyroscopic rigidity and precession.	U	NPTEL Gyro modules / Pallet
14	Mention the main gyroscopic flight instruments.	R	Attitude indicator, heading indicator / Syllabus
15	What is an attitude indicator (artificial horizon)?	U	Pallet / NPTEL

16	State the function of accelerometers in aircraft instruments.	U	Syllabus / Honeywell ref (modern)
17	What is a heading indicator? How does it differ from a magnetic compass?	U	NPTEL / Pallet
18	List common errors in gyroscopic instruments (e.g., drift, precession).	R	NPTEL / Anna Univ
19	What is the role of navigation instruments in aircraft?	U	Syllabus
20	Differentiate between pitot pressure and static pressure.	U	GATE AE air data / Pallet

Part B – 15 Marks (30 Questions)

No.	Question	Bloom's Level	Source/Reference
1	Explain the structure of the atmosphere and its layers. Discuss how atmospheric properties affect aircraft instruments.	U/An	Anderson, 2011 / Syllabus
2	Describe the pitot-static system in detail. With a neat sketch, explain how pitot and static pressures are used in flight instruments.	U/Ap	Pallet, 2016 / NPTEL Pitot-Static
3	Discuss the principle and operation of the Airspeed Indicator (ASI). Explain IAS, CAS, EAS, and TAS with relationships and corrections.	U/An	Anderson / GATE AE airspeeds ~2018–2022
4	Elaborate on True Airspeed (TAS), Equivalent Airspeed (EAS), and their importance in performance calculations. Derive TAS from EAS if possible.	U/Ap	Syllabus / Anderson
5	Explain the Mach meter. Discuss its construction, principle, and how it combines ASI and altimeter functions. Highlight errors (e.g., position error with Mach).	U/An	Pallet / GATE AE Mach questions ~2017
6	Describe the barometric altimeter. Explain its principle, operation, and types (sensitive vs. servo-assisted). Discuss QNH/QFE settings.	U/Ap	Pallet, 2016 / Anna Univ patterns
7	Analyze altimeter errors (instrument, position, hysteresis, temperature). Discuss how position error varies with Mach number.	An	GATE AE static vent errors / Pallet
8	Explain the Vertical Speed Indicator (VSI). Discuss its principle, lag issues, and Instantaneous VSI (IVSI) improvements using accelerometers.	U/An	NPTEL / Syllabus
9	Discuss gyroscopic principles (rigidity in space, precession). Explain how they are applied in aircraft instruments.	U/An	NPTEL Gyro modules / Pallet
10	With a neat diagram, explain the attitude indicator (artificial horizon). Discuss its gyro setup, erection system, and limitations (tumbling).	Ap/An	Pallet / NPTEL
11	Elaborate on the heading indicator (directional gyro). Compare it with a magnetic compass and explain slaved gyro systems.	U/An	NPTEL / Syllabus

12	Discuss accelerometers in flight instruments. Explain their role in VSI, turn coordinators, and modern AHRS (Attitude Heading Reference Systems).	U/An	Syllabus / Honeywell ref
13	Analyze common gyroscopic instrument errors (drift, precession, acceleration/turn errors). Suggest pilot corrections.	An/E	NPTEL / GATE conceptual
14	Explain navigation instruments (e.g., turn coordinator, slip-skid indicator). Discuss their integration with gyroscopic systems.	U/An	Syllabus
15	Compare mechanical gyro instruments with modern solid-state (MEMS, ring laser gyro) systems in terms of accuracy, reliability, and power.	An/E	NPTEL modern / Pallet
16	Discuss blocked pitot-static system effects on ASI, altimeter, and VSI. Provide pilot actions for each case.	An	GATE AE / Anna Univ
17	Analyze how temperature variations affect altimeter and airspeed readings. Discuss density altitude implications.	An	Anderson / Syllabus
18	Explain the operation of a turn-and-bank indicator or turn coordinator. Discuss rate of turn and coordination.	U/Ap	Pallet
19	Evaluate the importance of cross-checking pitot-static instruments during flight (e.g., alternate static source effects).	E	FAA/Anna Univ patterns
20	Discuss integration of flight instruments in glass cockpits (PFD/MFD) vs. traditional "six pack". Highlight advantages.	U/An	Modern relevance / NPTEL
21	With examples, explain how Mach number affects static pressure ports and instrument accuracy.	An	GATE AE position error questions
22	Analyze the role of gyroscopic instruments in instrument flight rules (IFR) conditions.	An	Syllabus / Pallet
23	Discuss vacuum vs. electric power sources for gyro instruments and redundancy considerations.	U/An	Pallet
24	Explain precession errors in attitude indicators during maneuvers (e.g., acceleration, turns).	An	NPTEL
25	Evaluate the use of accelerometers in inertial navigation systems (INS) for aerospace applications.	E	Extension / Syllabus
26	Discuss altimeter setting procedures (QNH, QFE, standard) and their impact on terrain clearance.	U/An	Pallet
27	Analyze how high-altitude flight affects instrument performance (e.g., low static pressure).	An	Anderson
28	Explain the principle of synchro transmitters in remote indicating instruments (e.g., remote altimeter).	U	Pallet
29	Discuss future trends in aircraft instruments (e.g., synthetic vision, AHRS integration).	U/C	Modern / CO5 link

30	Evaluate the safety implications of instrument failures (e.g., pitot tube icing) with real-world examples (if applicable).	E	Holistic / GATE-inspired