

Module 15

Gas Turbine Engines

	Level			
	A	B1	B2	B3
15.1 Fundamentals	1	2	-	-
Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop.				
15.2 Engine Performance	-	2	-	-
Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; Engine efficiencies; By-pass ratio and engine pressure ratio; Pressure, temperature and velocity of the gas flow; Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.				
15.3 Inlet	2	2	-	-
Compressor inlet ducts Effects of various inlet configurations; Ice protection.				
15.4 Compressors	1	2	-	-
Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades Compressor ratio.				

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15.5 Combustion Section Constructional features and principles of operation.	1	2	-	-
15.6 Turbine Section Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.	2	2	-	-
15.7 Exhaust Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	1	2	-	-
15.8 Bearings and Seals Constructional features and principles of operation.	-	2	-	-
15.9 Lubricants and Fuels Properties and specifications; Fuel additives; Safety precautions.	1	2	-	-
15.10 Lubrication Systems System operation/lay-out and components.	1	2	-	-
15.11 Fuel Systems Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	1	2	-	-

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15.12 Air Systems Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	1	2	-	-
15.13 Starting and Ignition Systems Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.	1	2	-	-
15.14 Engine Indication Systems Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Vibration measurement and indication; Torque; Power.	1	2	-	-
15.15 Power Augmentation Systems Operation and applications; Water injection, water methanol; Afterburner systems.	-	1	-	-
15.16 Turbo-prop Engines Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices.	1	2	-	-
15.17 Turbo-shaft Engines Arrangements, drive systems, reduction gearing, couplings, control systems.	1	2	-	-

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15.18 Auxiliary Power Units (APUs) Purpose, operation, protective systems.	1	2	-	-
15.19 Powerplant Installation Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1	2	-	-
15.20 Fire Protection Systems Operation of detection and extinguishing systems.	1	2	-	-
15.21 Engine Monitoring and Ground Operation Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.	1	3	-	-
15.22 Engine Storage and Preservation Preservation and depreservation for the engine and accessories/systems.	-	2	-	-