

GROUP CODE : AN

DIPLOMA CET CURRICULUM

Max :100 Marks

AERONAUTICAL ENGINEERING 2011--12

1. BASIC AERODYNAMICS

1x12=12Marks

The atmosphere, Fluid pressure, Standard atmosphere, International Standard Atmosphere (ISA), Temperature, Measurement of temperature, Conversion factors for units commonly used in various countries, Pressure, Pressure altitude, Effect of pressure, temperature and humidity on density, Density altitude, ICAO Standard atmosphere, Standard atmosphere as per ISA(International standard atmosphere), Behaviour of air, Speed of sound, Dynamic pressure, static pressure and total pressure Terms and difference between the three pressures, Explanation of total pressure in terms of dynamic and static pressure, air speed terminology in use and their meaning, Venturi tube, Theory of lift, The circulation theory of lift, Low speed aerofoil, Aerofoil terminology, Types of aerofoils. Factors affecting the performance of aerofoils. General theory of generation of lift in a wing, Aspect ratio and stalling angle, Sweep back wings, Slats and flaps, Effect of compressibility on lift, effect of various speeds on coefficient of lift(CL), Transonic and Supersonic Aerodynamics, Shock waves.

2. AIRCRAFT MATERIALS

1x5=5Marks

Selection of materials, economic consideration, Availability, Cost, shaping equipment required. Engineering considerations- Strength, Weight, Corrosion, Aircraft materials and their properties- types of plain carbon steel, Steel numbering system-SAE(Society of Automobile Engineers). Nickel alloys, Aluminium alloys, Composite materials, Advantages of composites, Corrosion and corrosion prevention and its effects on aircraft structures, important factors which influence corrosion process.

3. AIRCRAFT INSTRUMENTS I & II

1x10=10Marks

Four important Instrument elements, Pressure measurement systems, two main categories of pressure measurements- direct reading and remote indication, Temperature measurement systems for aircraft - special requirements, range, Methods of temperature measurements, RPM measurement systems and its importance, Fuel measurement systems, importance of fuel measurement, Fuel contents gauge, Float arm gauge, capacitor type of gauge. Pitot system of aircraft- purpose and working principle. Altimeter - theory of operation, Pressure altitude and indicated altitude, 'Q' Codes and their purpose, Air Speed Indicator- purpose, Air speed terminology, Square law compensation for air speed indicator, Rate Of Climb/Decent Indicator(ROCI)- purpose, Various types of Metering unit and its purpose, Machmeter - purpose and need for machmeter, Gyroscope- its application in aircraft, properties, Three degrees of freedom, Gyroscopic references, Limitations of a free gyroscope, Artificial Horizon (AH)- introduction, Turn And Bank Indicator (TBI)- its purpose, Aircraft Heading System- purpose, Components of a heading

system, Direction Indicating/Radio Indicating Compass- DI/RI Compass, RMI front panel/display, Cabin Pressurisation- need for cabin pressurization, Standard practice of pressurization, CPCV, Aircraft Oxygen System- purpose, Types of aircraft oxygen system i.e. continuous flow type and demand type, Important components, L O X (liquid oxygen) System, Comparison between gaseous and liquid oxygen systems, Head Up Display, Head Down Display, Multi Function Display, Fly- By Wire Technology.

4. AIRCRAFT STRUCTURES 1x8=8Marks

Air Frame Design and Construction- Structural members, Major structural stresses, Plane truss and analysis of forces in the members, Fixed Wing Aircraft- Identification of aircraft structural components for fixed wing, single engine, propeller driven aircraft, Fuselage Of Aircraft- various sections of fuselage, Types Of Fuselage- Truss type, Monocoque, Semi-monocoque, . Location And Numbering System- fuselage sections and the numbering system followed universally, Wing Structures- three fundamental designs for wing structure - Mono spar, Multi spar, Box Beam, Wing Configurations- various wing configurations, Leading edge shapes, Trailing edge shapes, common forms of wings- Low, Dihedral and Delta wings, Spars And Ribs purpose, Basics Of Honey Comb Section Wings- constant thickness and tapered core honey comb for wings, Basics Of Nacelles/Pods, Cowlings- Cowlings, skin and fairing, access and inspection, Main Control Surfaces- purposes, Loads On Aircraft- Types of loads, design load, Helicopter Structures-Location of major helicopter components, Wooden Aircraft Structures- aircraft fabrics, doping and dopes, Aircraft Painting and Finishing – importance, Effect of proper finishing.

5. AIRCRAFT SYSTEMS 1x9=9Marks

Aircraft Flight Control Systems- Axes of Motion Vertical, Longitudinal and Lateral, Primary Control Surfaces, SECONDARY Control Surfaces, Tertiary Control Surfaces, Primary flight controls-Pitch, Roll, Yaw, Throttle, Secondary effects of controls: explain briefly, Main Control Surfaces, Trim tabs, Spoilers, Flaps, Slats, Air brakes and Classification of flight control systems (FCS), Aircraft Fuel Systems- Fuel system. Information system- Fuel contents, Fuel Pressure, Low/critical fuel level warning, Positive transfer of fuel from various tanks, Safety-Protection of the systems from hazards, Maintenance checks, refuelling, De-fuelling, Quality checks for the fuel supply, Fuel Tanks- limitations, endurance, optimum utilisation, weight considerations, maintainability, classification of fuel tanks, Tank baffles, tank supports, flexible tanks. Aircraft Remote Control Systems Media-Mechanical, Aircraft Remote Control Systems-Hydraulic Media, Hydraulic System, Remote Control System- Pneumatic Media, Aircraft Undercarriage Systems, Features of Nose Undercarriage, Steering system of an Aircraft-need and types of steering, Aircraft Environment System- Cabin pressurization and air conditioning systems, Altitude limits, Aircraft Emergency Systems, Aircraft fire warning systems-common causes, Purpose and function of fire detection system, Ice And Rain Protection Systems-

Common flight hazards due to ice-pitot tubes, control systems etc, Areas sensitive for ice formation

6. PISTON ENGINE THEORY 1x4=4Marks

Otto cycle, Difference between two and four stroke spark ignition engines. Purpose of reduction gear box, Engine power, engine rating and engine efficiency, Super charging, Fuel and carburetion, Induction, cooling and exhaust.

7. JET ENGINE THEORY 1x11=11Marks

Basic theory of jet propulsion, Principle of operation of jet engine, Thrust and its equation. Classification of jet engines, Brayton cycle. Types of jet engines turbo prop, turbojet, turbofan. Types of inlet ducts subsonic and supersonic inlet ducts. Centrifugal and Axial flow compressor, compressor stalling and surging. Types of combustion chambers. Impulse and reaction type turbine. Purpose and working of Thrust reversal. Purpose of Afterburner.

8. AIRCRAFT ELECTRICAL SYSTEMS 1x6=6Marks

Power Distribution And Control- Types of switches, relays, contactors, fuses, circuit breakers, bus bars, AC and DC power distribution system, protection circuits like voltage, current and frequency, A C Motors- Fundamentals, Stepper motor, A.C servo motors, Power Conversion Equipment- Purpose and usage, Static inverter, Rotary inverter, Aircraft Lighting System- Types of lighting.

9. AIRCRAFT MAINTENANCE PRACTICE AND AIRCRAFT SERVICING 1x8=8Marks

Aircraft Documents- purpose and importance, explain contents of Aircraft maintenance manual, Structural repair manual purpose, applicability, Illustrated parts catalogue, Service bulletin, Service Instruction, Inspection Schedule, Aircraft Servicing Equipment-purpose and importance, Aircraft Movements- Towing and Taxying, Mooring of Aircrafts- Tie down anchors, cables and chains, Precautions against strong winds, heavy storms. Weighing and leveling of aircraft

10. AVIONICS AND AIRCRAFT RADIO SYSTEMS 1x9=9Marks

Radio Communication System Fundamentals – EM waves, medium of propagation, Radio and radar frequency spectrum, uses and limitation of R.F. bands. Radio wave propagation – ground wave, sky wave, radiation angle, skip distance, diffraction, field strength, absorption, Scattering, reflection, fading, ducting, critical frequency, Antenna Fundamentals - Dipole, half wave dipole, resonant & Non-resonant antenna. Antenna gain, directional power, Antenna Losses and efficiency, band

width, beam width, band width, polarization, Types of various communication used in aircraft- VHF, UHF, HF SATCOM, Intercom, PA system, Navigation System of aircraft- safe route, economy, shortest possible route, Flight Data Recorder(FDR) and Cock Pit Voice Recorder (CVR), Location of FDR and CVR, Radar range equation, Purpose and use RADAR in various fields, meaning of Primary RADAR, Secondary RADAR- advantages, disadvantages, Secondary RADARS , Doppler RADAR, INS, GPS.

11. CIVIL AVIATION REQUIREMENTS (CAR) 1x3=3Marks

Aircraft Act 1934, Procedure For Issue of CAR-scope, Definitions, Procedure for defect recording, reporting rectification and analysis, Initial Information, Review of defects, Report monitoring, Classification of defects, Aircraft Maintenance Programme And Their Approval: purpose, primary maintenance process, Aircraft Log Books.

12. MAINTENANCE MANAGEMENT 1x10=10Marks

Failure Analysis-Concepts of failure, Early failures, Chance failures, Wear out failures, bath tub curve, Catastrophic failures, Degradation failures, Independent failures, Secondary failures, Reliability Analysis- Reliability concepts, Failure rate, MTBF, MTTF,MTTR Hazard rate, areas of reliability, Life testing and reliability, Classification of life testing, Maintainability and availability, Factors affecting maintainability, Objectives of maintenance, Forms of maintenance, Out sourcing, Built in test equipment(B I T E), Total productive maintenance(TPM), Prophylactic maintenance, Condition monitoring, Predictive maintenance, Vibration monitoring and control, Computerization of aircraft basic data maintenance, Ergonomics, Ergonomical reasons for layout of display panels ,various components/assemblies in an aircraft, ergonomics for decision making, management information system(MIS),environmental management: global environmental issues, ozone layer depletion, regulation on pollution and prevention, function of pollution board , environment act 1986.

13. FLIGHT AND MAINTENANCE SAFETY 1x5=5Marks

Role of DGCA and ICAO. Types of contamination on ATF. Quality control of ATF: Purpose of quality control check on ATF, Places where checks are to be conducted, common methods for ATF quality checks. Preservation of Aircraft and Engine: Aircraft and engine awaiting repairs or critical components, need for preservation of aircraft and engine , safety precautions to be taken, Need for proper care and documentations, log book entries Cannibalizations of parts and sub/full assemblies from the aircraft awaiting repairs/components, improper documentations in log books/records, effects at later stages, De-preservation of new/ preserved engines, checks to be performed. Aircraft Tyres and operational safety: General care to be taken for tyres- on storage, Effect of under pressure and over pressures in tyres- in small, medium and big aircrafts on braking, during take off, during landings.