UNIVERSITY OF BRISTOL
FACULTY OF ENGINEERING

First Year Examination for the Degree of
Batchelor of Engineering and Master of Engineering

MAY/JUNE 2011 2 Hours

Aerospace Vehicle Design and System Integration

AENG10001

This paper contains *40* questions

Questions carry *1 mark* each.
The maximum for this paper is *40 marks*

Q1 **When did the first successful, manned, rotary-winged aircraft fly?**

a) 1903
b) 1907
c) 1923
d) 1936

Q2 **Who invented the first successful, manned, rotary-winged aircraft?**

a) Wright Brothers
b) Igor Sikorsky
c) Juan de la Cierva
d) Igor Bensen

Q3 **The very low power-to-weight ratio of engines fitted to the first successful helicopters (such as the Fa-61 and the Breguet-Dorand Gyroplane Laboratoire) was the primary reason why:**

a) they were slower than their fixed-wing counter parts
b) they had small diameter rotors
c) they didn't have a tail rotor
d) the rotor speed was limited

Q4 **Compound helicopters can fly faster than conventional helicopters because they:**

a) have greater installed power
b) have additional (fixed) wing surfaces
c) have a dedicated propulsion system
d) they can partially off-load the duties of the main rotor

Q5 **The main operational difference between the most highly developed autogyro and the helicopter is that it:**

a) cannot take-off or land vertically
b) has a lower maximum flight speed
c) cannot hover for sustained periods
d) is able to land safely in the event of total power loss

Q6 **The helicopter rotor configuration most conducive to carrying a variety of different payloads is:**

a) Conventional main rotor with tail rotor
b) Tandem rotor
c) Synchropter (inclined side-by-side)
d) Coaxial, contra-rotatingQ1

Q7 **Who was the first person to design and develop a successful gas turbine for aircraft propulsion in the UK?**

a) Stanley Hooker
b) Frank Whittle
c) Barnes Wallis
d) Reginald Mitchell.

Q8 **What approximate temperature do the exhaust gases leave the combustion chamber of a modern gas turbine?**

a) 900K
b) 1300K
c) 1900K.
d) 2500K

Q9 **From what part of the engine does the air needed to cool the high pressure turbine come from?**

a) Inlet to the compression system
b) The by-pass stream
c) Combustion exhaust
d) Exit to the compression system

Q10 **What engine powered the Concorde supersonic Airliner?**

a) Adour
b) Olympus
c) Spey
d) Pegasus

Q11 **For what aircraft was the first high by-pass ratio engine designed?**

a) Lockheed Tristar
b) Boeing 747 Jumbo
c) Lockheed C5A
d) Douglas DC10

Q12 **Modern fan blades are made from what metal?**

a) Titanium
b) Aluminium
c) Nickel based alloy
d) Magnesium

Q13 **Which one of these statements does not describe safety?**

a) The state in which risk is lower than some pre-defined upper level.
b) Freedom from conditions that can cause death or injury.
c) The attribute of a system to perform correctly on demand.
d) Freedom from conditions that can cause damage to equipment or the environment.

Q14 **A systematic failure is one where;**

a) Several interconnected parts have failed.
b) We can predict when the failure will occur.
c) We can use probability to quantify risk of failure.
d) Several systems are affected by failure.

Q15 **Which of the following best describes a random failure?**

a) A 'bug' in navigation software.
b) An aircraft display overheating when parked in sunshine.
c) The filament blowing in the 'call attendant' cabin light.
d) An aircraft skidding off the runway in icy conditions.

Q16 **Introducing redundancy into a system involves;**

a) Building it from obsolete components.
b) Building it with more parts than are needed to operate.
c) Switching between parts to reduce wear and tear
d) Reducing the workforce making the system components.

Q17 **Why do large aircraft have batteries in their electrical system?**

a) To start the engines
b) To provide back-up power
c) To supply low voltage lamps

d) To keep the security alarm power when on stand

Q18 What are the standard distribution voltages on current civil airliners?

a) 28VDC and 115VAC 3 phase 400Hz.
b) 28VAC and 115VDC 3 phase 50Hz.
c) 24VDC and 220VAC 1 phase 50Hz.
d) 24VAC and 220VDC 1 phase 400Hz.

Q19 The installed electrical generation capacity of the A380 is approximately

a) 50,000 W
b) 500,000 W
c) 5,000,000 W
d) 50,000,000 W

Q20 The 'More Electric Aircraft' initiative is about;

a) Reducing aircraft noise
b) Increasing the power of the main engines
c) Reducing the weight of aircraft components
d) Making aircraft easer to maintain.

Q21 'CVG' stands for

a) Constant Velocity Gearbox
b) Controlled Voltage Generator
c) Certified Valve Group
d) Concentric Variable Gear.

Q22 Which one of the following systems uses the largest amount of power?

a) Flight control actuation
b) Environmental control
c) Galley heating
d) Wing de-icing

Q23 Which statement is least accurate?

a) Hydraulic actuation systems can be made to fail safe.
b) Hydraulic actuation systems are easy to maintain.
c) Hydraulic actuation systems have a high power/weight ratio.
d) Hydraulic actuation systems are an established technology

Q24 Which of the following acronyms does not refer to a navigation or communication system?

a) TCAS
b) CFIT
c) GPS
d) IFF

Q25 Radar systems are not used for

a) locating other aircraft
b) detecting rain and snow
c) determining aircraft height
d) measuring altitude

Q26 A federated architecture is one which;

a) is being introduced on the latest aircraft
b) uses differing hardware for individual functions.
c) combines functions onto a single processor

d) is designed by several different individuals for safety.

Q27 On a modern airliner fuel is not used for;

a) powering the engines.
b) de-icing.
c) cooling electronics
d) trim.

Q28 An aircraft with a glass cockpit has;

a) large windows for improved visibility
b) large area multi function displays
c) dedicated displays for each instrument
d) has optical fibres in place of cables.

Q29 Under air worthiness regulations an event that significantly increases crew workload and causes some injury is classed as;

a) minor
b) major
c) hazardous
d) catastrophic

Q30 A gyroscope measures

a) acceleration
b) velocity
c) angular velocity
d) angular acceleration

Q31 The position error of an inertial navigation system will

a) increase with flight time as the error is cumulative
b) reduce with flight time as more measurements average out the error
c) stay the same as error is based only on initial calibration
d) periodically increase and decrease due to tiny variations in gravity

Q32 Which of the following describes an effect of increasing RF frequency?

a) range increases
b) antenna size increases
c) data rate increases
d) all of the above.

Q33 'Fly by wire' means

a) flight control surfaces actuated by wire cable and pulleys, as opposed to a push rod.
b) having no mechanical link between the pilot and control surface
c) The use of electrical autopilot to fly the plane
d) power for flight surface actuation provided electrical cables.

Q34 Identify which of the following is not a real aircraft control surface

a) elevon
b) slateron
c) ruddervator
d) taileron

Q35 The attitude indicator is;

a) part of the primary flight display showing pitch and roll
b) part of the navigation display showing heading
c) part of the ECAM display showing operational information

d) part of the airline customer service questionnaire.

Q36 VOR beacons offer improvements compared to the older ADF navigation system because;

a) The VOR system operates via satellite link
b) The VOR system requires no moving parts
c) The VOR system works on oceanic routes
d) The VOR infrastructure is much cheaper

Q37 GPS has limitations for aircraft navigation use because;

a) It only covers certain parts of the globe
b) GPS receivers do not work well at altitude
c) It is not as robust as other systems
d) The US charges royalties on airlines using the system

Q38 To calculate vertical velocity we need to measure;

a) static air pressure only
b) dynamic air pressure only
c) both static and dynamic air pressure
d) height and static and dynamic air pressure

Q39 What is the function of the 'localiser'?

a) to keep the aircraft aligned with the runway on landing
b) to keep the aircraft on the correct decent when landing
c) to re-tune the aircraft's radio to traffic control at different airports
d) to locate the aircraft if it has been lost.

Q40 Which statement is most correct

a) Aircraft technology generally leads other sectors
b) Aircraft technology often lags behind other sectors
c) Aircraft technology is unique and not used in other sectors
d) Aircraft technology is cheap compared to other sectors because there are lots of aircraft