

Code: 9A21801

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B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

AIRCRAFT INSTRUMENTATION & CONTROL SYSTEMS

(Aeronautical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Define 'trim' of an aircraft.
(b) Explain the control actuation, with neat sketches, of the cable type and of the 'push-pull rod' type.
- 2 (a) Describe the starting system of an engine in a modern aircraft.
(b) Describe 'throttling'.
- 3 (a) Why is fuel pressurization required in flight? How is it achieved?
(b) Describe the fuel meters/gauges/sensors.
- 4 (a) Describe a simple hydraulic system to actuate a flap.
(b) With the help of neat sketches, explain the steering system of a landing gear.
- 5 Explain the different types of power generation in modern aircraft.
- 6 Explain:
(a) Engine bleed.
(b) Dehumidifier.
(c) Pilot-static systems.
- 7 Describe in detail the flight deck display system of a modern aircraft.
- 8 Explain:
(a) Top-down and bottoms-up approaches in the capture of requirements for a system design.
(b) Review process in design and development a product or system.

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- 1 (a) Describe the various control surfaces of a modern aircraft.
(b) Describe an electro-hydrostatic actuator.
- 2 (a) What is the principle of integrated flight and propulsion control?
(b) Describe the fuel flow and airflow controls in an engine.
- 3 (a) Establish the need for and describe the external fuel tanks of an aircraft.
In what way do they differ from the internal ones?
(b) Describe, with the help of neat sketches, the pumps used in a fuel system
and the purposes they serve.
- 4 (a) What are the different functions carried out by the hydraulic systems in an
aircraft of the Boeing 707 category?
(b) Describe a typical hydraulic circuit.
- 5 Describe the power distribution, power conversion and energy storage
systems in a modern aircraft.
- 6 (a) Explain pneumatic power, and its use in an aircraft.
(b) Describe the aircraft engine starting systems.
(c) Explain anti-icing systems used in aircraft.
- 7 Write notes on the following systems used in the early aircraft:
(a) Horizon sensor.
(b) Altimeter.
(c) Direction indicator.
- 8 Trace the various steps involved in the design and development of a
system.

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- 1 Describe the implementation of control actuation in modern Boeing aircraft.
- 2 Compare the old and modern systems for fuel control of engines.
- 3 With the help of neat sketches, describe the fuel system of a modern aircraft. Describe all the parts, in detail.
- 4 With the help of schematics and sketches, describe the different components of a typical hydraulic system for the control of an aircraft.
- 5 Write short notes on:
 - (a) Variable speed constant frequency generator.
 - (b) Emergency power generation in aircraft.
 - (c) The different voltages of power used in a modern aircraft and the systems onboard to achieve these voltages.
- 6 Write short notes on:
 - (a) Need for controlled environment in an aircraft.
 - (b) Thrust reversers.
 - (c) Ram air cooling.
- 7 Describe the various sensors used in an aircraft.
- 8 Explain:
 - (a) Fault tree analysis.
 - (b) Markov analysis.

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- 1 Describe the fly-by-wire control systems of modern aircraft.
- 2 (a) Describe a modern engine control system.
(b) How is an engine started?
- 3 (a) Describe the various fuel valves in the fuel system of an aircraft.
(b) What are the different options for in-flight refueling?
- 4 Describe, with the help of neat sketches, the retraction/extension system of the landing gear of an aircraft using a hydraulic system.
- 5 Write short notes on:
(a) AC and DC powers used onboard an aircraft.
(b) Ground power.
(c) Load protection.
(d) Gear system.
- 6 Describe, in detail, with the help of neat sketches, a boot strap refrigeration system used in aircraft.
- 7 Trace the changes in flight deck instrumentation from early times to now.
- 8 Describe:
(a) The various phases in the life cycle of a product.
(b) Failure mode and effect analysis.
