AE VTU Question Paper Set

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10AE81

Eighth Semester B.E. Degree Examination, June/July 2016
Flight Vehicle Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define Design. Briefly explain the design process of an aircraft with a flow chart. **(10 Marks)**

b. Mention the performance parameter for designing an aircraft. **(10 Marks)**

2 a. Derive an expression for wing loading effect on Glide rate. **(10 Marks)**

b. Define Load Factor. Show that the designer can minimize $\frac{D}{W}$ with respect to $\frac{W}{S}$ with the relation $\frac{W}{S} = \frac{q}{n} C_{\left(\frac{L}{D}\right)_{min}}$ **(10 Marks)**

3 a. Write short notes on the following :
(i) Airfoil shape selection
(ii) Base Drag Estimation. **(10 Marks)**

b. Mention and briefly explain the volume consideration mode while designing an aircraft fuselage. **(10 Marks)**

4 a. Discuss the following topics in detail:
(i) Propulsion selection
(ii) Propeller Design for cruise condition **(10 Marks)**

b. Explain the spread shut approach for Turbo-Jet engine sizing. **(10 Marks)**

PART – B

5 a. Derive an expression for aircraft ground roll. **(10 Marks)**

b. Enlist all phases of flight landing with schematic sketch and mention all the expression related to each phase. **(10 Marks)**

6 a. Discuss briefly any two refined weight estimation methods used in aircraft. **(10 Marks)**

b. Explain longitudinal stability effect on performance of the aircraft. **(10 Marks)**

7 a. Sketch and explain three commonly used landing gear arrangements. **(10 Marks)**

b. Explain anti icing and de-icing system in an aircraft. **(10 Marks)**

8 a. Explain a typical flight control system. **(10 Marks)**

b. Write short notes on :
(i) Radio navigation system
(ii) Aircraft weapon system. **(10 Marks)**

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10AE82

Eighth Semester B.E. Degree Examination, June/July 2016
Avionics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With the help of a schematic diagram explain split bar bus system. **(10 Marks)**
b. Explain the importance of avionics systems in civil and military aircrafts. **(10 Marks)**

2 a. Explain the principle of inertial navigation system with a suitable schematic diagram. **(10 Marks)**
b. With a neat sketch, explain the structure of stable platform. **(10 Marks)**

3 a. What are the concepts and features of fly by wire systems? With a neat sketch, list the elements a fly by wire flight control system. **(08 Marks)**
b. Briefly explain the concept of copper Harper scale. **(06 Marks)**
c. What are the common modes of failures in avionics systems? **(06 Marks)**

4 a. Explain the primary flight display systems used in civil aircrafts with a neat sketch. **(10 Marks)**
b. With the help of a schematic diagram, explain the functioning of air data computers. **(10 Marks)**

PART – B

5 a. With a help of schematic diagram, explain the working of superheterodyne receiver. **(08 Marks)**
b. Briefly explain the different equipments used in airborne communication systems. **(12 Marks)**

6 a. With a neat sketch explain the architecture of a general microprocessor. **(08 Marks)**
b. Write short notes on : i) DRAM ii) PROM iii) EEPROM iv) Flash memory. **(12 Marks)**

7 a. Briefly explain the following : i) CRT display ii) plasma panel. **(10 Marks)**
b. With a neat sketch explain the working principle of head up display. **(10 Marks)**

8 a. Briefly explain the different elements of element electronic wavefare. **(10 Marks)**
b. With the help of schematic diagram, briefly explain the different word formats used in MIL STD 1553 B data bus. **(10 Marks)**

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10AE831

Eighth Semester B.E. Degree Examination, June/July 2016
Flight Testing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is the purpose and planning of flight testing? Explain sources of errors in flight test techniques. **(10 Marks)**

b. Explain methods for avoiding or minimizing such errors. **(10 Marks)**

2 a. The airspeed indicator fitted to particular airplane has no instrument error and is calibrated assuming incompressible flow in standard conditions. While flying at sea level in ISA conditions, the indicated air speed is 264m/sec. Find true air speed. **(08 Marks)**

b. What are pressure and temperature sensing devices? Explain the corresponding transducing techniques. **(12 Marks)**

3 a. Explain propeller driven airplane PIW – VJW theory for level flight performance. **(12 Marks)**

b. Explain the Data Reduction Methods for steady climbs. **(08 Marks)**

4 What are various test methods for determining take off distance? Explain data reduction for takeoff distance and landing distance and write empirical equations for correcting take-off distances to standard conditions for jet and constant speed propeller driven airplanes. **(20 Marks)**

PART – B

5 a. What is the effect of freeing the stick on neutral point position? Explain Flight – path stability measurement from flight testing. **(10 Marks)**

b. Explain flight test method for evaluating phugoid and phugoid data reduction. **(10 Marks)**

6 a. Describe the dutch roll, dutch roll flight test techniques, dutch roll data reduction. **(12 Marks)**

b. An approximate equation for an aircraft roll mode is

$P + 0.25p = 5.5\ \delta a(t)$

i) Determine the steady roll rate for a step input of 10^0.

ii) Determine the magnitude of roll rate after an elapsed time of

a) t = 1 time constant ($1\tau_R$) ii) t = 5 time constant ($5\tau_R$). **(08 Marks)**

7 a. Explain the Cooper – Harper Rating scale. **(10 Marks)**

b. What are various flight phases and what are various flight envelopes? **(10 Marks)**

8 a. What are CAR requirements governing stall and what are safety considerations while performing stall maneuver? **(10 Marks)**

b. What is Autorotation? What are effects of mass moment of inertia and Airframe components on spin? Explain Flight Test methods for spin testing. **(10 Marks)**

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10AE848

Eighth Semester B.E. Degree Examination, June/July 2016
Aircraft Systems and Instrumentation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the operation of a push-pull rod control system used for operating the elevator through a powered actuator unit with a neat sketch. **(10 Marks)**

b. Explain the following with a neat diagram.
   i) Mechanical actuation
   ii) Electro – hydraulic actuation. **(10 Marks)**

2 a. Explain the following :
   i) Hydraulic fluid, with examples. What are its advantages?
   ii) Power packs, with relevant diagram
   iii) Hydraulic actuations, with relevant diagram. **(12 Marks)**

b. Draw a sketch of simplified bleed air system and associated aircraft systems. Explain the same. **(08 Marks)**

3 a. Explain the gravity feed fuel systems, with neat diagram. **(10 Marks)**

b. With a help of neat sketch explain fuel tank. Name some of the fuel tanks used. **(10 Marks)**

4 a. With neat sketch explain the importance of cabin distribution system. **(08 Marks)**

b. Explain the following with neat diagram.
   i) Vapour cycle cooling system.
   ii) Liquid cooling system. **(12 Marks)**

PART – B

5 a. Under instrument grouping, explain both flight instruments and power plant instruments grouping, with a neat sketch. **(10 Marks)**

b. Describe the principle of operation of a head up display with a schematic diagram. **(10 Marks)**

6 a. With a neat sketch, describe the mach warning system. **(10 Marks)**

b. Describe altitude – alerting system, with a neat sketch. **(10 Marks)**

7 a. With the aid of diagrams, describe how a ball type of bank indicator indicates.
   i) A correctly banked turn.
   ii) A turn to star board in which the aircraft is over banked. **(10 Marks)**

b. Define gyroscope. Mention its three degrees of freedom. Explain the term gimbals systems of a free (or) space gyroscope, gyroscopic inertia (or) rigidity and precession; and angular momentum. **(10 Marks)**

8 a. Explain the turbine vibration monitoring system, with neat sketch. **(10 Marks)**

b. Explain typical automatic temperature – control engine system, with neat sketch. **(10 Marks)**

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10AE848

Eighth Semester B.E. Degree Examination, June/July 2015

Aircraft Systems and Instrumentation

Time: 3 hrs. Max. Marks: 100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is the need of flight control system? With neat sketch explain power assisted flight control system. **(10 Marks)**

b. Stating the advantages and disadvantage explain fly – by – wire system with necessary sketch. **(10 Marks)**

2 a. List the advantage and disadvantages of hydraulic system used in aircraft. **(05 Marks)**

b. With a neat sketch explain typical high pressure pneumatic system used in aircraft. **(10 Marks)**

c. Write a note on : Hydraulic accumulator. **(05 Marks)**

3 a. What is the purpose of an aircraft fuel system? With neat sketch explain generalized fuel system of large transport aircraft. **(10 Marks)**

b. Explain with neat sketch, Vane type fuel pump. **(10 Marks)**

4 a. Explain operation of vapour cycle cooling system with necessary sketch. **(10 Marks)**

b. What are the consequences of information? With neat sketch explain hot air anti-icing system. **(10 Marks)**

PART – B

5 a. With neat sketches explain 'blind flying panel' and basic 'T' type of instrument grouping. **(10 Marks)**

b. Write a note on :
i) Power plant instruments.
ii) Head up display system. **(10 Marks)**

6 Explain the following systems with neat sketches.
a) Pitot – static system.
b) Mach meter.
c) Vertical speed Indicator. **(20 Marks)**

7 a. Define the two fundamental properties of gyroscope and on what factors do these properties depend. **(10 Marks)**

b. What is meant by 'earth rate and how the input axis of a gyroscope would have to be aligned to exhibit apparent drift equal to this rate? **(10 Marks)**

8 a. What is tachometer? With neat sketch explain a mechanical tachometer. **(10 Marks)**

b. How are engine temperature measuring instruments classified? Explain how resistance is being measured using wheatstone bridge? **(10 Marks)**

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10AE81

Eighth Semester B.E. Degree Examination, June/July 2015

Flight Vehicle Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain overview of airplane design process. **(08 Marks)**

b. Calculate near exact weight for an airplane from a guess value for the following data, where W_e is the empty weight and W_o is the takeoff weight.

$$\frac{W_e}{W_o} = 0.97\ W_o^{-0.05} \text{ and } W_o = \frac{10{,}500}{1 - 0.4 - \frac{W_e}{W_o}}$$ **(12 Marks)**

2 Explain the effect of wing loading on stall speed, take off distance, catapult take – off, landing distance, cruise, loitter for endurance, instantaneous turn and sustain turn. **(20 Marks)**

3 a. Explain the wing sweep angle selection criteria? **(10 Marks)**

b. Draw layout of a spread sheet for wing design. **(10 Marks)**

4 a. What are engine installed thrust correction? **(10 Marks)**

b. A jet engine performance data is given below :
rpm = 9500
EGT = 450°C
w_f (fuel consumption) = 1850 Kg/hr
w_a = (air consumption) = 91 Kg/Sec
F_n (net thrust) = 4510 Kg
TFSC (thrust specific fuel consumption) = 0.5
The test is carried out at pressure of 102.6 kPa and ambient temperature of 30° C. Correct the test data for ISA conditions (pressure 101.3 kPa and temperature 15° C) **(10 Marks)**

PART – B

5 a. What is balanced field length? **(06 Marks)**

b. Draw spread sheet layout for take – off and landing distance. **(14 Marks)**

6 a. Explain rudder area sizing. **(12 Marks)**

b. What is neutral point, c.g. margin and static margin? **(08 Marks)**

7 a. Explain Alternating current electrical power system for an aircraft. **(10 Marks)**

b. What is Castoring – wheel geometry? **(10 Marks)**

8 a. Explain a typical flight control system. **(12 Marks)**

b. Briefly describe weapon carriage and gun installation on military aircraft. **(08 Marks)**

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10AE837

Eighth Semester B.E. Degree Examination, June/July 2015

Operation Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the scope of operation Research. **(10 Marks)**

b. A firm manufactures two types of products A and B and sells them on a profit of ₹ 2 on type A and ₹ 3 on type B, each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H while type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hour 40 minutes while machine H is available for 10 hours during any working day. Formulate the problem as a linear programming problem and obtain the solution using graphical method. **(10 Marks)**

2 a. Solve the problem using simplex method

Maximize $Z = 2x_1 + 10x_2 + x_3$

Subject to $5x_1 + 2x_2 + x_3 + s_1 \le 15$

$2x_1 + x_2 + 7x_3 + s_2 \le 20$

$x_1 + 3x_2 + 2x_3 + s_3 \le 25$

$x_1, x_2, x_3 \ge 0.$ **(10 Marks)**

b. Solve the following Linear Programming problem by dual – simplex method.

Maximize $Z = 2x_1 + x_3$

Subject to $x_1 + x_2 - x_3 \ge 5$

$x_1 - 2x_2 + 4x_3 \ge 8$

$x_1 + 3x_2 + 2x_3 + s_3 \le 25$

$x_1, x_2, x_3 \ge 0.$ **(10 Marks)**

3 a. Find the intial basic feasible solution using Vogel's approximation method and then optimize by MODI method.

Destination

Origin	P	Q	R	Supply
A	5	7	8	70
B	4	4	6	30
C	3	7	7	50
Demand	65	42	43	150

(10 Marks)

b. Using the following cost matrix, determine the optimal job assignment and the cost of assignment.

Jobs

Person	J_1	J_2	J_3	J_4	J_5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

(10 Marks)

4 a. Solve the following problem using Gomory's technique. **(12 Marks)**

Maximize $Z = x_1 + 2x_2$

Subject to $x_1 + 2x_2 \leq 12$

$4x_1 + 3x_2 \leq 14$

$x_1, x_2, x_3 \geq 0$ And are integers

b. Solve the following Zero – one integer programming problem.

Maximize $Z = 3x_1 + x_2 + 3x_3$

Subject to $-x_1 + 2x_2 + x_3 \leq 4$

$4x_1 - 3x_3 \leq 2$ **(08 Marks)**

$x_1 - 3x_2 + 2x_3 \leq 3$

$x_1, x_2, x_3 = (0,1)$

PART – B

5 a. A project consists of a series or tasks labeled A, B, C, D, E, F, G, H, I with the following relationships (W < X, Y mean X and Y connot start until W is completed :X, Y < W means W cannot start until both X and Y are completed.)With this notation construct the network diagram having the following constraints.

A < D, E; B, D < F ; C < G; B < H; F, G < I.

Find also the optimum time of completion of the project, when the time (in days) of completion of each task is as follows :

Task :	A	B	C	D	E	F	G	H	I
Time :	23	8	20	16	24	18	19	4	10

(14 Marks)

b. Explain the basic steps, involved in PERT/CPM techniques. **(06 Marks)**

6 a. In a hair dressing saloon with one barber, the customer available follows Poisson distribution at an average rate of one every 45 minutes. The service time is exponentially distributed with a mean of 30 minutes. Find

i) Average number of customers in the saloon.

ii) Average waiting times of a customer before service.

iii) Average idle time of the barber. **(10 Marks)**

b. A super market has two sales girls brining up the sales at counters. If the service time for each customer is exponentially distributed with a mean of 4 minutes and the people arrive in Poisson distribution at counters at the rate of 10 per hour, determine all the measures of multiple server model. **(10 Marks)**

7 a. What do you mean by zero – sum game? Explain the characteristics of a game. **(08 Marks)**

b. Solve the following game with the pay off matrix

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	1	7	3	4
	A_2	5	6	4	5
	A_3	7	2	0	3

(07 Marks)

c. What are the assumptions of a Two person zero sum game. **(05 Marks)**

8 a. Use graphical method to minimize te time needed to process. The following job on machines shown. Also calculate the total time needed to complete both the jobs.

Job I	Sequence of machines	A	B	C	D	E
	Time (hrs)	3	4	2	6	2
Job II	Sequence of machines	B	C	A	D	E
	Time (hrs)	5	4	3	2	6

(12 Marks)

b. Determine the optimal sequence for the six jobs that minimizes the total elapsed time (in hrs). Also determine the idle time for each machine.

Job No.	1	2	3	4	5	6
Machine I	5	9	4	7	8	6
Machine II	7	4	8	3	9	5

(08 Marks)

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10AE82

Eighth Semester B.E. Degree Examination, June/July 2015
Avionics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Bring out the requirements of avionics in civil & military aircraft. **(06 Marks)**

b. Explain split bus bar system used for electrical power distribution on board the aircraft. **(08 Marks)**

c. List different types of cables used for connecting on board electrical system and explain them. **(06 Marks)**

2 a. Explain basic operational principle of an Inertial Navigation system. **(10 Marks)**

b. With a neat schematic diagram, explain the working principle of stable platform. **(10 Marks)**

3 a. Explain Quadruplex actuation system, with neat diagram. **(06 Marks)**

b. With neat diagram, explain generalized dissimilar redundant flight control system architecture. **(06 Marks)**

c. Explain roll rate command control, with neat diagram. **(08 Marks)**

4 a. Explain 'basic T' and 'basic six' instrument grouping in flight, with neat diagram. **(08 Marks)**

b. State the color assigned to the display in EFIS and the type of information to which they correspond. **(04 Marks)**

c. Explain basic air data system, with a neat block diagram. **(08 Marks)**

PART – B

5 a. Explain the different radio frequency band on which the aircraft communications are usually carried out. **(10 Marks)**

b. Explain slot antenna, with neat sketch. **(05 Marks)**

c. With a neat diagram, explain the transmitter in a communication system. **(05 Marks)**

6 a. Explain the principle of µp, with neat diagram. **(08 Marks)**

b. List various types of memories and briefly explain. **(12 Marks)**

7 a. List the advantages and disadvantages of CRT, LED, LCD. **(10 Marks)**

b. Briefly discuss the following : i) DVI ii) HUD. **(10 Marks)**

8 a. Explain different transfer formats that are used in MIL – STD 1553 B, with neat diagram. **(10 Marks)**

b. Explain Integrated Avionic System architecture, with neat diagram. **(10 Marks)**

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