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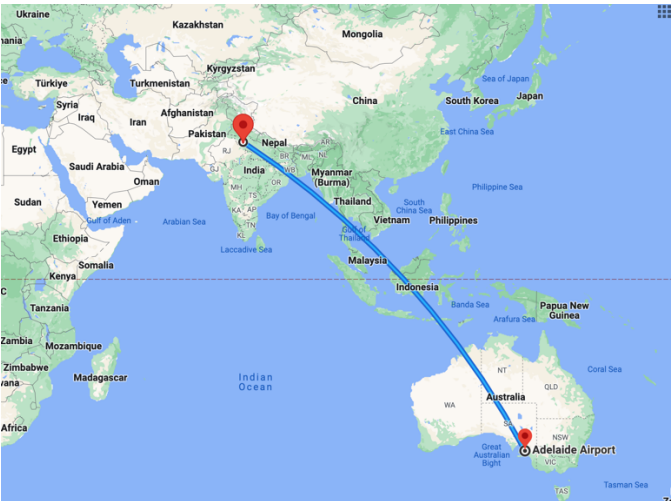
UPES
End Semester Examination, May 2024

Course: Introduction to Avionics **Semester: 6**
Program: B.Tech Aerospace Engineering (Avionics) **Time : 03 hrs.**
Course Code: AVEG3004 **Max. Marks: 100**

Instructions:

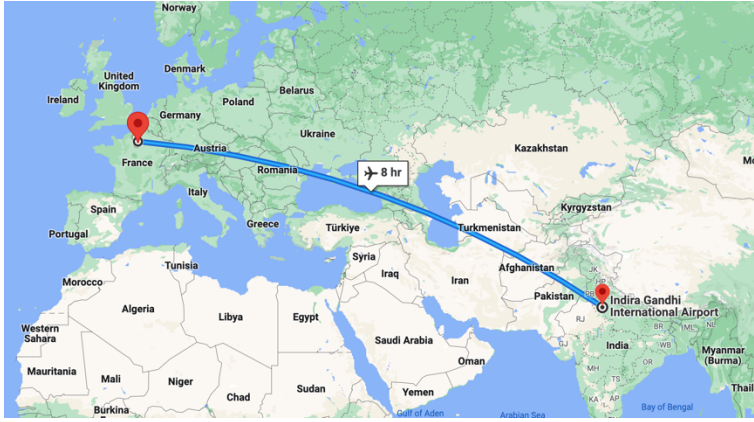
1. Please read each question carefully and then proceed to answer it.
2. Answer all questions.
3. Use figures and diagrams wherever necessary.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	List out and comment on the different common mode failures that an aircraft could encounter?	4	CO3
Q 2	<p>The figure (Fig 1) below shows the flight path of an aircraft from New Delhi, India to Adelaide, Australia. Why is the flight path curved? Shouldn't the flight path be a straight line connecting the two points which would give you the shortest distance? Explain the concept behind this?</p>  <p style="text-align: center;">Fig 1: Flight path from New Delhi, India to Adelaide, Australia.</p>	4	CO1

Q 3	Calculate the required line-of-sight range of a VHF radio for an aircraft cruising at 35,000 ft trying to connect to a VHF tower of 100 ft height so that the signal is successfully received by the VHF receiver?	4	CO1
Q 4	Justify, why do we need a Fly-By-Wire system in an aircraft?	4	CO3
Q 5	Explain the various terms involved in the time domain specification of servo systems.	4	CO2
SECTION B (4Qx10M= 40 Marks)			
Q 6	Elucidate the two prominent redundant configurations found on an aircraft? Also, illustrate with an example, the working principle of any one voting mechanism?	10	CO3
Q 7	Illustrate the application of linear regression analysis with a simple example. Explain how a best fit line is estimated for a given set of input and output variable. Also, list down 3 different MATLAB commands that is used to perform linear regression analysis.	10	CO2
Q 8	a) Explain the principle behind the FBL technology using a suitable diagram? b) Summarize the different sensor failures that usually occur in an aircraft.	5+5	CO2 + CO3
Q 9	Elaborately discuss about the architecture of ARNIC 629 data bus along with the word structure? Or a) Briefly discuss each field in ARNIC 429 databus ? b) Explain the two standard coupling methods through which a remote terminal(s) could be connected to a main bus in MIL STD 1553B?	10 Or 5+5	CO4 Or CO4

SECTION-C
(2Qx20M=40 Marks)

Q 10	Distinguish between each word formats used in MIL STD 1553B? Also, with help of a diagram, summarize the purpose of each field for <i>three</i> word formats of MIL STD 1553B?	20	CO4
Q 11	<p>a) Imagine you are travelling in a B777 aircraft from New Delhi, India to Paris, France as a passenger. The inflight entertainment system displays a map as shown in Fig. 2.</p> <p>Calculate the distance in nautical miles between New Delhi and Paris using the information given below:</p> <p>New Delhi: 28.6139° N ; 77.209° E Paris: 48.8566° N ; 2.3522° E</p>  <p>Fig 2: Flight path from New Delhi International Airport to Adelaide International Airport.</p> <p>Hint: Use laws of cosines to compute the distance</p> <p>b) Describe the force-voltage and force-current analogies used in mathematical modelling of electrical systems.</p> <p align="center">Or</p> <p>Using schematic diagrams, describe the working principle and operation of inertial navigation system of a civil aircraft in detail along with each sensor it consists of? Discuss the major disadvantage of each sensor in an IMU and explain how the disadvantages are compensated to obtain near accurate attitude information of an aircraft?</p>	<p>10 + 10</p> <p align="center">Or</p> <p>20</p>	<p>CO1</p> <p align="center">Or</p> <p>CO1</p>