Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH (AERONAUTICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: PE-I: NAVIGATION GUIDANCE AND CONTROL [AAE 4009]

REVISED CREDIT SYSTEM

Time: 3 Hours 31/12/2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Define the Navigation, Guidance and Control with neat diagram. **(02)**

1B. Explain the engagement geometry for deviated pursuit guidance. Find the time of interception and discuss the trajectory in (V_θ, V_R) –space. **(05)**

1C. What are the differences between SNS & INS? Explain their working principle. **(03)**

2A. Sketch a tactical missile and identify the important subsystems. **(02)**

2B. Derive the mathematical model and design a state feedback controller of balancing a pointer. The desired closed –loop poles are -4 & -5. Discuss the open loop stability. **(04)**

2C. Draw and explain the block diagram of pulse radar and CW Doppler radar. **(04)**

3A. Explain the working principle and components of DGPS. **(02)**

3B. Derive the radar range equation with neat diagram. **(03)**

3C. Derive the multi-layer perceptron model and explain the neural network control scheme of a robotic link with neat diagram. **(05)**

4A. Explain the difference of tactical and strategic missile. **(02)**

4B. Write the principle of DME. Briefly explain the DME system installed on ground and in aircraft with neat diagram. What are the frequencies and range of operation? **(03)**

4C. Discuss the necessary conditions for optimality of a dynamic system of order **(05)**

n, $d\mathbf{x}/dt = A\mathbf{x} + B\mathbf{u}; \mathbf{x}(0) = \mathbf{x}_0$

5A. Draw the missile-target engagement geometry for PPN guidance law. **(02)**

5B. Derive the expression for miss-distance between two objects moving in a straight line. Also, obtain the expression for the time at which the miss-distance occurs. **(03)**

5C. Derive the equation $\hat{X}_k = K_k Z_k + [1 - K_k] \hat{X}_{k/k-1}$ of a dynamic system by combining measurements and prediction in Kalman filter. Sketch the neat diagram of discrete Kalman filter implementation steps. **(05)**