Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

FIRST SEMESTER M.TECH. (CONTROL SYSTEMS)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: NAVIGATION GUIDANCE AND CONTROL [ICE 5124]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Define The following terms: (a). Navigation (b). Guidance (c). Control	**2**
1B.	With illustration, describe the various flight control surfaces.	**4**
1C.	The aerodynamic coefficient of an A/C is approximated by: $Zu/V = -1$, $Ze/V = -0.1$, $Mq = -0,5$, $M\alpha = -0.5$, $Me = -9$, $X\alpha/V = -14$, $Xe/V = -1$ Rest of the variables is assumed to be zero. Velocity is 69m/sec. Find the short period and phugoid mode.	**4**
2A.	How damping can be increased in a displacement autopilot? Explain with the help of a block diagram.	**4**
2B.	Draw the functional diagram of Pitch Orientational Control System.	**3**
2C.	Describe velocity control system with diagram.	**3**
3A.	Represent the lateral dynamics of an aircraft in state space format. Define the different modes based on the Eigen values.	**3**
3B.	What is a Dutch Roll? How it can be eliminated?	**3**
3C.	Design an automatic lateral beam guidance system.	**4**
4A.	With the help of necessary waveforms derive the expression of beat frequency for receding and approaching target, for a triangular FM-CW RADAR.	**6**
4B.	What is threshold detection? What are the pros and cons of it?	**3**
4C.	Find the power density at a target situated at a distance of 50Km from RADAR radiating a power of 100MW, from a lossless isotropic antenna. If this RADAR now employs a lossless isotropic antenna with a gain of 5000 and the target has a radar cross-section of $1.2m^2$, then what is the power density of echo signal at receiver?	**3**
5A.	What is instrument landing system? Briefly explain the different categories in ILS.	**4**
5B.	Explain inertial navigation system.	**4**
5C.	List the various satellite navigation systems.	**2**