

Design of A Track-Following Controller for Hard Disk Drives

- a) Grades obtained in this individual assignment shall contribute towards 10% of the total marks for the EE3304 exam
- b) You should submit your **FULL** report (in PDF) and source codes in a zipped folder via email latest by **26 February 2016** to:

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- c) Note that plagiarism and copying are serious offences and students caught doing so will be severely punished. Late reports will also be penalized
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1. A picture of commercial 3.5" Hard Disk Drive (HDD) is shown below in Fig. 1.



Fig. 1: Inside a commercial 3.5" HDD.

Assignment 1

From frequency response measurements, the model of the voice coil motor (VCM) $P(s)$ in a HDD is obtained as:

$$P(s) = \frac{1 \times 10^8}{s^2}.$$

Assume that the sampling frequency is 30 kHz. Design a digital lag-lead controller for the VCM to meet the following specifications:

- i) Gain margin (GM) > 5 dB and phase margin (PM) > 40°
- ii) Gain crossover frequency > 500 Hz
- iii) 10% settling time < 10 ms
- iv) Less than 20 % overshoot and zero steady-state error

(10 marks)