

EPL 446 SPINTRONICS & DATA STORAGE
MAJOR 29 April 2008 2007-08 SEM-II

Time: 2 hr

M. Marks: 50

All questions are of 10 marks each. Give short and to the point answers only.

1. Consider an all metal spin-valve device
 - (a) Sketch a normal SV showing various layers and state the role of each of them.
 - (b) Sketch a SV with SAF, and explain the need of SAF in the device. State its benefits.
 - (c) Draw MR vs H plots for SV with (i) single pinned layer and (ii) synthetic pinned layer.

5+3+2
2. Consider MTJ structures for use in data storage.
 - (a) Briefly explain how binary logic is generated using MR structures?
 - (b) Sketch and briefly explain the working of the MRAM device.
 - (c) Sketch R vs H plot to show the way a data bit is stored. In what way the FM layers can be adjusted to achieve the writing of the bit?

3+4+3
3.
 - (a) If it is desired to pin the magnetization direction of a written bit, what would be your suggestions to achieve this?
 - (b) What are your suggestions to enhance MR of a GMR device?
 - (c) Sketch the scheme for reading a '0' and a '1' state by a reading head.

4+4+2
4.
 - (a) Differentiate between planar, perpendicular and patterned media for their use in magnetic data storage.
 - (b) What are the possible new generation spintronic devices? Sketch a spin transistor, clearly indicating the desired properties of its various parts.

6+4
5.
 - (a) How does GMR score over AMR as a read head (ignore the %MR as a reason)?
 - (b) Give the various biasing fields present in a spin valve read head.
 - (c) List the advantages of magnetoelectronic devices over conventional electronic devices.
 - (d) What are the possible options for 'gating' in spintronic devices?

2+3+3+2