

**\*\*\* EXAMINATION \*\*\***

**MACROSPIN MODELS OF SPIN TRANSFER DYNAMICS**

1. **A final contribution to the torque on the free layer comes**
  - a) from a phenomenon called spin pumping
  - b) from a phenomenon called back-reaction torque
  - c) from a phenomenon called spin transfer torque
  - d) from a phenomenon called spin polarization
  
2. **Back-reaction torque is one of the consequences of**
  - a) the spin polarization
  - b) the injected spin current
  - c) the spin transfer torque
  - d) the ejected spin current
  
3. **The stochastic LLG equation was solved using**
  - a) differential calculus
  - b) Ito calculus
  - c) integral calculus
  - d) differential equations
  
4. **The hysteresis loops close as the**
  - a) sweep rate decreases
  - b) sweep rate increases
  - c) sweep rate switches path
  - d) sweep rate deteriorates
  
5. **The simulated current sweeps are limited by the**
  - a) degree of numerical convergence
  - b) available computing resources
  - c) simulators patience
  - d) All of the above
  
6. **Spin valves are ohmic devices, so the Fourier transform of**
  - a) this series is proportional to the associated current path
  - b) this series is proportional to the associated spin current
  - c) this series is proportional to the associated power spectrum
  - d) this series is proportional to the associated polarization

7. **The time series data for the magnetoresistance are collected**
  - a) on the OPP/AP phase boundary at 1000 K
  - b) on the OPP/AP phase boundary at 2000 K
  - c) on the OPP/AP phase boundary at 3000 K
  - d) on the OPP/AP phase boundary at 4000 K
8. **More recent pulsed-field experiments have been successfully**
  - a) analyzed using the Landau-Lifshitz equation
  - b) analyzed using conventional Gilbert damping
  - c) analyzed using conventional rotational damping
  - d) analyzed using conventional gyromagnetic ratio
9. **Gilbert damping occurs when a normal metal is in intimate**
  - a) contact with a pressing thin-film ferromagnet
  - b) contact with a pressing gyromagnetic ratio
  - c) contact with a pressing spin-pumping torque
  - d) contact with a pressing oersted magnetic field
10. **The phase diagram of the sine-torque model differs mostly in**
  - a) detail with the power output of the minimal model
  - b) detail with the data collection of the minimal model
  - c) detail with the magnetic simulation of the minimal model
  - d) detail with the phase diagram of the minimal model
11. **Spin-transfer torque reports for process that cannot be**
  - a) described by an energy functional, process is non-equilibrium
  - b) described by an energy functional, process is thermodynamic
  - c) described by an energy functional, process is adiabatic
  - d) described by an energy functional, process is diagnostic
12. **Large topological changes occur if the Gilbert damping**
  - a) parameter is allowed to change with process
  - b) parameter is allowed to change with fields
  - c) parameter is allowed to change with angle
  - d) parameter is allowed to change with model
13. **A dynamical behavior interpreted as rapid switching**
  - a) between two states of magnetization is the magnetic noise
  - b) between two states of magnetization is the telegraph noise
  - c) between two states of magnetization is the spin noise
  - d) between two states of magnetization is the torque noise
14. **Realistic calculations proves that a transverse component of**
  - a) angular momentum will be absorbed by the ferromanganese
  - b) angular momentum will be absorbed by the ferronickel
  - c) angular momentum will be absorbed by the ferromagnetic
  - d) angular momentum will be absorbed by the ferromagnet

15. **The inclusion of spin-transfer torque excites incoherent**
- a) spin waves in the fixed layer
  - b) spin waves in the free layer
  - c) spin waves in the telegraph noise
  - d) spin waves in the macrospin model
16. **The hysteresis loop closing is**
- a) much greater at high field than at low field
  - b) much greater at low field than at high field
  - c) unlikely at high field than at low field
  - d) unlikely at low field than at high field
17. **The spin-orbit interaction is the primary source of the**
- a) spin-transfer torque
  - b) angle dependent damping
  - c) magneto-crystalline anisotropy
  - d) telegraph noise
18. **Magnetostatics is the study of static**
- a) electric fields
  - b) magnetic radiation
  - c) magnetic wave
  - d) magnetic fields
19. **A unit of magnetic field strength or intensity is the**
- a) Oersted
  - b) ferromagnet
  - c) magnetostatic
  - d) magneto-crystalline anisotropy
20. **The birth of spintronics is due to the discovery of the**
- a) Colossal magnetoresistance (CMR)
  - b) Giant magnetoresistance (GMR)
  - c) Magnetic tunnel effect (TMR)
  - d) Anisotropic magnetoresistance (AMR)

GEOGRAPHIC INFORMATION SYSTEMS  
 GEOGRAPHIC INFORMATION CENTER  
 PO BOX 5839  
 MC ALLEN, TEXAS 78502-5839

1-800-522-0139  
 kh@acnet.net  
 Copyright 2010

<b>*** ANSWER SHEET *** U541</b>  <b>MACROSPIN MODELS OF SPIN TRANSFER DYNAMICS</b>	<u>STATE BOARD</u>	<u>COURSE NO.</u>	<u>VALUE</u>
			8 PDH
Office Use Only			

FILL IN ONE BOX FOR EACH ANSWER.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

I hereby certify that I studied the course materials, and the above answers are my own. No one has helped me to complete this exam.

\_\_\_\_\_  
 Signature Date

\_\_\_\_\_  
 Printed or typed name

\_\_\_\_\_  
 Seal or Number

**GEOGRAPHIC INFORMATION SYSTEMS  
GEOGRAPHIC INFORMATION CENTER  
PO BOX 5839  
MC ALLEN, TEXAS 78502-5839**

**(800) 522-0139  
kh@acnet.net  
Copyright 2010**

---

**Name** \_\_\_\_\_

**Company** \_\_\_\_\_

**Address** \_\_\_\_\_

**City** \_\_\_\_\_ **State** \_\_\_\_\_ **Zip** \_\_\_\_\_

**Telephone** \_\_\_\_\_ **E-Mail** \_\_\_\_\_

**Fax** \_\_\_\_\_ ( ) **24-Hour Fax**

( ) **Yes** ( ) **No** **If fax and telephone are the same number, shall we call first?**

**Mail the certificates to above address** \_\_\_\_\_ **check address** \_\_\_\_\_ **envelope address**

**State + Specialty + PE Registration number (i.e. TX EE 12389)** \_\_\_\_\_

**State + Professional Land Surveying registration number** \_\_\_\_\_

**NC (North Carolina) + Specialty + PE Registration number** \_\_\_\_\_

**NC (North Carolina) + Professional Land Surveying registration number** \_\_\_\_\_

**Professional Affiliations** \_\_\_\_\_

Return this page with your answer sheet and a check or money order for \$100 per course. Use one check for each registrant (in your company) taking one or more courses. We accept company checks (if they are your employer's). We do not accept third-party checks or checks outside of your city of residence. Using third-party checks that do not include your name or company name may invalidate your professional development hours being reviewed by an audit process. Add \$5 for same day processing and priority shipping.

Make checks or money orders payable to Geographic Information Systems.

