**武汉大学物理科学与技术学院2019－2020(一)**

**《量子力学》课程期末考试试题A卷**

**学号： 姓名： 专业： 得分：**

1. (15 points)A needle of length l is dropped at random onto a sheet of paper ruled with parallel lines a distance l apart. What is the probability that the needle will cross line?
2. (15 points)A particle in the infinite square well has initial wave function:

(1). Determine A(3 points);

(2). Find (6 points);

(3). Calculate ,as a function of time t(3points);

(4). Calculate all values of energy and their probability(3 points).

1. (15 points) Deduce the Uncertainty Principle:(9 points), and energy-time uncertainty principle (6 points).
2. (15 points)An operator , has two normalized eigenstates  and , with eigenvalues  and , respectively. Operator  has two normalized eigenstates  and , with eigenvalues  and . The eigenstates are related by

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(1). Observable *A* is measured, and the value  is obtained. What is the state of the system after this measurement?(4 points)

(2). If *B* is now measured, what are the possible results, and what are their probability?(4 points)

(3). Right after the measurement of *B*, *A* is measured again. What is the probability of getting ?(7 points)

1. (12 points)An electron is in the spin state , find the expectation value of Sx, Sy, Sz.
2. (12 points)Write down the Hamiltonian for two noninteracting identical particles in the infinite square well(3 points), and find the wave functions of ground and two excited states for identical fermions(9 points).
3. (8 points)suppose we perturb the infinite cubical well by putting a delta function bump at the point(a/4,a//2,3a/4):

Find the first-order corrections to the energies of the first excited states.

1. (8 points)Find the ground state energy of the delta-function well potential with trial wave function .