

國立中央大學100學年度碩士班考試入學試題卷

所別：大氣物理研究所碩士班 不分組(一般生) 科目：普通物理 共 1 頁 第 1 頁

本科考試禁用計算器

*請在試卷答案卷(卡)內作答

1. A small block is 12 cm from the center of a turntable. The radius of the block remains fixed up to an angular velocity of 5.1 rad/sec. When the angular velocity is increased beyond this amount, the block slides off. What is the coefficient of friction? (10%)
2. A 5 kg block slides down a frictionless incline from a height of 10 meters. The incline is smoothly joined a 37 degree incline. What is the change in potential of the block after it has traveled 10 meters along the 37 degree incline? What is the maximum speed of the block? (10%)
3. A sphere of radius 2 meters is center at the origin. A force of (3, 5, -2) Newtons is applied where the sphere intersects the positive x-axis. What is the torque on the sphere? (10%)
4. A man weights 700 Nt at the equator. Supposing that the speed of the earth is double, how much would he weight at the same point (the earth's radius $R_E = 6400$ km and 1 day = 86400 sec.)? (10%)
5. The intensity of the earth's electric field near its surface is 100 N/c, point down. At an altitude of 1500 m this field is 25 N/c pointing down too. (i) Find the average charge density of the atmosphere from the surface to this altitude. (ii) If the charge of the earth is concentrated on the surface, find the average charge of the area on the surface (in the permittivity in free space ϵ_0). (10%)
6. An infinity long line charge has a charge per unit length of 3×10^{-8} C/m. One point is 10 cm away from the line charge. Another is 20 cm. Find the potential difference between the two points (in V). (10%)
7. Two conducting spheres with radii a and $2a$ contact each other. Give a charge Q and then separate. Find ratios of the (i) charge, (ii) charge density, (iii) potential and (iii) electric field between the two spheres. (10%)
8. A flat conduct 2.0 cm wide and 1.0 mm thick is perpendicular to a 0.60 Tesla magnetic field. The current is 25 amps and the Hall potential is 6.0 micro volts. What is the drift speed? (10%)
9. A circular loop of wire is spinning about its diameter in a uniform magnetic field of 1.5 Tesla. The loop has a radius of 10 cm. When the plane of the loop makes an angle of 60 degrees with the magnetic field, the EMF induced in it is 1.3 volts. What is the angular velocity of the loop? (10%)
10. The transparent film of aluminum oxide having an index of refraction 1.80 is deposited on a sheet of polished aluminum. If we wish the sheet to appear orange (wavelength 600 nanometers) when view with white light. How thick should the film be? (10%)

參考用