

國立中央大學九十學年度碩士班研究生入學試題卷

所別: 大氣物理研究所 不分組 科目: 電磁學 共 1 頁 第 1 頁

- (10%) 1. 1(a). Describe Coulomb's law of electrostatics.
1(b). Sketch the field lines of the electric field due to a pair of equal but opposite electric charges.
1(c). Calculate the electric field at the midpoint of the pair of electric charges.
- (15%) 2. 2(a). Describe the property, in differential and integral forms, that allows an electrostatic field possessing a scalar potential.
2(b). Describe the relationship between an electrostatic field and its scalar potential, in differential and integral forms.
2(c). Give the electric potential due to an electric dipole.
2(d). Calculate the electric field due to the electric dipole.
2(e). Sketch the field lines of the electric field due to an electric dipole.
- (10%) 3. 3(a). Describe Gauss' law of electrostatics in differential and integral forms.
3(b). Sketch the field lines of the electric field due to a uniform charge on the surface of a sphere.
3(c). Calculate the electric field inside and outside the sphere.
- (15%) 4. 4(a). Describe Biot-Savart's law of magnetostatics.
4(b). Sketch the field lines of the magnetic field due to an electric current along a circle.
4(c). Calculate the magnetic field at the center of the circle.
- (10%) 5. 5(a). Describe the property, in differential and integral forms, that allows a magnetostatic field possessing a vector potential.
5(b). Describe the relationship between a magnetostatic field and its vector potential, in differential and integral forms.
5(c). Sketch the field lines of the magnetic field due to a magnetic dipole.
- (15%) 6. 6(a). Describe Ampere's law of magnetostatics in differential and integral forms.
6(b). Sketch the field lines of the magnetic field due to a uniform longitudinal current on the surface of a straight cylinder.
6(c). Calculate the magnetic field inside and outside the cylinder.
- (10%) 7. 7(a). Describe Faraday's law of magnetic induction.
7(b). Sketch the field lines of the electric field which is induced by a longitudinal magnetic field, temporally changing but spatially uniform, in a cylindrical region.
7(c). Calculate the induced electric field in terms of the temporal change of the magnetic field.
- (15%) 8. 8(a). Describe the continuity equation for conservation about electric charge and current, in differential and integral forms.
8(b). Describe Maxwell's displacement current. How is Maxwell's displacement current needed to preserve conservation about charge and current?
8(c). Describe Maxwell's equations of electrodynamics.
8(d). Describe Poynting vector of energy flux. How is Poynting vector needed in the conservation about electromagnetic energy.