Nepal College of Information Technology

**Unit Test**

Fall 2012

Program : BE CE Time : 2 hrs

Semester : (VI) FM : 50

Subject : Electromagnetic PA PM : 25

* *Candidates are requested to give their answer as far as practicable in their own words.*
* *The figure in the margin indicates the full marks*
* ***Attempt ALL question***

1. Derive the expression for magnetic potential due to a volume of static charge with volume charge density ρ. Extend the concept to the time-varying case to find the expression for Vector Magnetic Potential due to a current carrying conductor with current density J. What do you mean by Retarded Magnetic Potential? Explain. (5+5+5 Marks)

2. Derive the expression for field components {Er, Eθ, EΦ} and {Hr, Hθ, HΦ} at a distant point P(r, θ, Φ) due to an alternating current element dl excited with the source ICoswt. (15 Marks)

3. Find the expression for total power radiation due to a half-wave dipole of length λ/2 aligned in Z-axis. Consider the average power radiation P(Average) as follows:

**P (Average) =** **η [{**Im**2**\***Cos2 (Π/2 Cosθ)} /8 Π2r2Sin2θ],** watt/m2

Where, η is intrinsic impedance of free-space, Im is the current maximum, θ is the angle made by the line joining the point under consideration P(r, θ, Φ) and center of the dipole with the Z-axis, r is the distance between P(r, θ, Φ) and center of the dipole. In which direction does this radiated power flows, explain. Hence, find the radiation resistance for half-wave dipole and quarter-wave monopole antenna. (10+2+3 Marks)

4.Write Short notes on: (2.5\*2 Marks)

a) Maxwell’s Equations

b) Radiation Resistance of an antenna

Nepal College of Information Technology

**Unit Test**

Fall 2012

Program : BE CE Time : 2 hrs

Semester : (VI) FM : 50

Subject : Electromagnetic PA PM : 25

* *Candidates are requested to give their answer as far as practicable in their own words.*
* *The figure in the margin indicates the full marks*
* ***Attempt ALL question***

1. Derive the expression for magnetic potential due to a volume of static charge with volume charge density ρ. Extend the concept to the time-varying case to find the expression for Vector Magnetic Potential due to a current carrying conductor with current density J. What do you mean by Retarded Magnetic Potential? Explain. (5+5+5 Marks)

2. Derive the expression for field components {Er, Eθ, EΦ} and {Hr, Hθ, HΦ} at a distant point P(r, θ, Φ) due to an alternating current element dl excited with the source ICoswt. (15 Marks)

3. Find the expression for total power radiation due to a half-wave dipole of length λ/2 aligned in Z-axis. Consider the average power radiation P(Average) as follows:

**P (Average) =** **η [{**Im**2**\***Cos2 (Π/2 Cosθ)} /8 Π2r2Sin2θ],** watt/m2

Where, η is intrinsic impedance of free-space, Im is the current maximum, θ is the angle made by the line joining the point under consideration P(r, θ, Φ) and center of the dipole with the Z-axis, r is the distance between P(r, θ, Φ) and center of the dipole. In which direction does this radiated power flows, explain. Hence, find the radiation resistance for half-wave dipole and quarter-wave monopole antenna. (10+2+3 Marks)

4.Write Short notes on: (2.5\*2 Marks)

a) Maxwell’s Equations

b) Radiation Resistance of an antenna