ROLLNO RR 211002

2006 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

IV B.TECH II SEMESTER REGULAR EXAMINATIONS

ELECTROMAGANETIC THEORY

(ELECTRONICS & CONTROL ENGINEERING)

APRI/MAY 2006

TIME : 3HOUR
MARK :100

ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS

1. (a) Distinguish between potential and potential gradient. Explain why in the analysis of electrostatic fields, it is simpler to use electric potential that electric field strength.

(b) State and explain conservative property of electric field.

2. (a) Show that the displacement current in the dielectric of a parallel plate capacitor is equal to the conduction current in the leads.

(b) Investigate the vector magnetic potential for the infinite, straight, current element L in free space.

3. Find the magnetic field intensity due to the presence of a finite straight filament conductor carrying current I using Ampere's Law for current element: Hence establish the relations for semi-infinite and infinite wires.

4. (a) Given E = Em sin(?t -ßz)ay in free space, find D, B and H.

(b) A current sheet K= (8/µ0) ay (A/m), at x = 0 separates region 1, x < 0 and µr1 = 3, from region 2, x > 0 and µr2 = 1. Given H1 = (10/µ0) (ay + az) A/m find H2.

5. (a) Show that the ratio of total electricfield E to the total magnetic field H is equal to the intrinsic impedance of the medium.

(b) A copper wire carries a conduction current of 1 amp. Determine the displacement current in the wire at 100MHz. Assume copper has the same permittivity as free space and s = 5.8 × 107mhos/m.

6. (a) If loss tangent tan? = (s /?e) , show that
a = 0.5?(µe)0.5 tan? [{1 + (1 + tan2?)0.5}/ 2]-0.5and
ß = ?(µe)0.5 [{1 + (1 + tan2?)0.5}/ 2]-0.5
(b) A plane wave propagates in a certain medium with E = 5 cos(109t - 30z) ax V/m Find a, ß, ?, ? and phase velocity of propagation.

7. (a) Give and explain a proper interpretation of the poynting vector.

(b) In free space (z<=0), a plane wave with Hi = 10 cos (108t -ßz) ax mA/m is incident normally on a lossless medium (e= 2 eo ,µ = 8µo) in region z>=0. Determine the expression for reflected and transmitted electric and magnetic fields.

8. (a) Derive the pointing theorem from Maxwell's equations and explain its physical significance.

(b) A plane wave is traveling in a medium for which s=0, er=3,µr=1 if Epeak=5v/m find

i. Peak poynting vector
ii. Average poynting vector
iii. Peak value of H
iv. Impedance of medium

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