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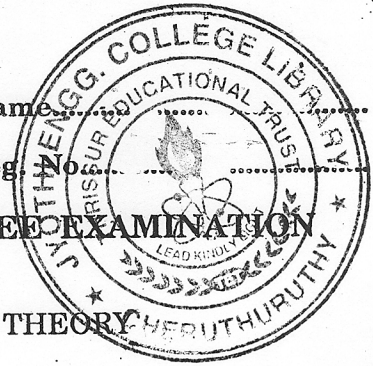
FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION OCTOBER 2011

EC/PTEC 09 503—ELECTROMAGNETIC FIELD THEORY

(2009 admissions)

Time : Three Hours   Maximum : 70 Marks

Part A

1. State Divergence theorem.

2. What is magnetic dipole moment ?

3. What is conduction current ?

4. What are the conditions for a wave to be circularly polarized ?

5. What is meant by dominant mode of wave propagation ?

$(5 \times 2 = 10$ marks$)$

Part B

1. Find the divergence of $\vec{A} = r\vec{a}_j + r\cos^2\theta\,\vec{a}_\phi$.

2. Derive the boundary conditions at the interface separating dielectric and conductor in an electric field.

3. Derive the Maxwell's equation from Faraday's law.

4. Write in brief about plane waves in lossless dielectrics.

5. Explain in brief phase velocity and group velocity.

6. What are cavity resonators ? Write in brief.

$(4 \times 5 = 20$ marks$)$

Part C

1. Prove Divergence theorem for vector field $\vec{A} = 2xy\,\vec{a}_x + (x^2 + z^2)\,\vec{a}_y + 2yz\,\vec{a}_z$.

Or

2. Derive the magnetic Boundary conditions.

3. A uniform plane wave in free space has Electric field given by $E_s = 10e^{-j\beta x}\vec{a}_z + 15e^{-j\beta x}\,\vec{a}_y$ V/m. Describe the wave polarization, Find H_s and determine the average power density.

Or

4. Derive the expression for capacitance of a parallel plate capacitor using Laplace equation.

5. Explain the reflection of plane wave at oblique incidence due to perpendicular polarization.

Or

6. Explain the refraction of plane waves by dielectric.

7. Explain how stub matching is performed for impedance matching with one example.

Or

8. Explain the TE mode propagation and derive the field components for a Rectangular waveguide.

$(4 \times 10 = 40$ marks$)$