Reg. No. : | | | | | | | | | | |

Question Paper Code: 52922

M.E. DEGREE EXAMINATION, DECEMBER 2015

Elective

Communication Systems

15PCM512 - NUMERICAL TECHNIQUES IN ELECTROMAGNETICS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The vector fields B and H are related by the equation

   (a) $B=2H$ (b) $B=\mu H$ (c) $B=EH$ (d) $B=\sigma H$

2. In Legendre Functions,

   (a) $P_n(-x)=(-1)^n P_n(x)$ (b) $P_n(-x)=-P_n(x)$

   (c) $P_n(x)=(-1)^n P_n(-x)$ (d) $P_n(-x)=P_n(x)$

3. The three _____ sources of errors in numerical solution of physical problems are modeling errors, truncation errors and round-off errors.

   (a) avoidable (b) unavoidable (c) both a and b (d) none of these

4. A vector is said to be _____ if its norm is 1.

   (a) orthogonal (b) planar (c) normal (d) unique

5. Newton's method is used to find the roots of the derivative which is also known as

   (a) optimization points (b) stationary points

   (c) linear points (d) elliptic points

PART - B (5 x 3 = 15 Marks)

6. What are time varying fields?

7. Express the plane wave e^{jz} in terms of spherical wave functions.

8. What are the steps involved in a finite difference solution?

9. Write short notes on Galerkin method.

10. What is Armijo rule in line search?

PART - C (5 x 16 = 80 Marks)

11. (a) (i) Give a detailed account of magneto static fields and derive the necessary equations. (12)

(ii) Show that the continuity equation is implicit in Maxwell's equations. (4)

Or

(b) Explain in detail about time varying potentials. (16)

12. (a) Explain the Separation of Variables in Cylindrical coordinates in terms of 2-D Laplace equations. (16)

Or

(b) A semi infinitely long cylinder $(z \geq 0)$ of radius a has its end at $z=0$ maintained at $V_0(a^2-\rho^2)$, $0 \leq \rho \leq a$. Find the potential distribution within the cylinder. (16)

13. (a) Solve the diffusion equation $\frac{\partial^2 \phi}{\partial x^2} = \frac{\partial \phi}{\partial t}, 0 \leq x \leq 1$ subject to the boundary conditions $\phi(0,t) = 0 = \phi(1,t) = 0, t > 0$ and initial condition $\phi(x,0) = 100$. (16)

Or

(b) How the finite difference techniques are used to study the characteristics of transmission lines? (16)

14. (a) Solve the Eigen value problem $\phi'' + \lambda\phi = 0$, where 0<x<1 with boundary conditions $\phi(0) = 0 = \phi(1)$. (16)

Or

(b) Explain the method of evaluation of errors in Monte Carlo Methods. (16)

15. (a) Explain in detail about Newton's method for unconstrained optimization. (16)

Or

(b) Explain particle swarm optimization with a neat example. (16)

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