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

Question Paper Code: 31033

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2015.

Third Semester

Electrical and Electronics Engineering

01UEE303 - FIELD THEORY

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. What are the different co-ordinate systems?
2. Define divergence and curl.
3. State Coulomb's law and write the mathematical expression.
4. Write Laplace's and Poisson's equations.
5. What is Lorentz law of force?
6. Define magnetic vector potential.
7. Write down the point form of Maxwell's equation using Faraday's law.
8. Distinguish between transformer emf and motional emf.
9. Define skin depth and determine the intrinsic impedance of free space.
10. What is meant by poynting vector?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) What are the different coordinate systems used to represent field vectors? Discuss about them in brief. (8)

(ii) State and prove the divergence theorem. (8)

Or

(b) (i) For a vector field *A*, show explicitly that $\Delta.\Delta x A = 0$: that is the divergence of the curl of any vector field is zero. (8)

(ii) Explain in detail about Stokes theorem. (8)

12. (a) (i) State and prove Gauss's law. (8)

(ii) State Laplace and Poisson's equations and explain their significance in the field theory. (8)

Or

(b) (i) A cylindrical capacitor consists of an inner conductor of radius *'a'* and outer conductor of radius '*b*'. The space between the conductors filled with a dielectric whose permittivity is ε, the length of the capacitor is *L*. Determine the capacitance. (12)

(ii) A parallel plate capacitor having an area of $1m^2$, distance between the plates is $0.02m$ and filled with a dielectric of dielectric constant 6. Calculate the capacitance. (4)

13. (a) (i) Derive Biot – Savart's law and Ampere's law using the concept of magnetic vector potential. (8)

(ii) Obtain the expression for energy stored in magnetic field and also derive an expression for magnetic energy density. (8)

Or

(b) (i) Derive the boundary conditions of magnetic field at dielectric and conductor. (8)

(ii) What is magnetization? Explain the classification of magnetic materials with examples. (8)

14. (a) (i) Derive the expressions for displacement current and conduction current densities. (8)

(ii) State and derive the Maxwell's equation for free space in integral and point forms for time varying fields. (8)

Or

(b) (i) State and explain Faraday's law of electromagnetic induction. Hence derive the expressions for statically and dynamically induced emf's. (10)

(ii) Compare the field theory and circuit theory. (6)

15. (a) (i) Derive the expressions for input impedance and standing wave ratio of transmission lines. (12)

(ii) Find the skin depth of δ at a frequency of $1.6MHz$ in aluminum $\sigma = 38.2Ms/m$ and $\mu_r = 1$. (4)

Or

(b) (i) State and derive electromagnetic wave equation in phasor form. (10)

(ii) Explain in detail the behavior of plane waves in lossless medium. (6)

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