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

Question Paper Code : 50474

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Third Semester
Electrical and Electronics Engineering
EE 6302 – ELECTROMAGNETIC THEORY
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. State Coulomb's law.

2. Define gradient. What does it indicate ?

3. State Poisson's and Laplace's equations.

4. Define dielectric strength.

5. State Ampere's circuital law.

6. What is inductance ? Give its formula in electrical parameters.

7. What is displacement current ?

8. State any two major differences between circuit theory and field theory.

9. Define skin depth.

10. What is intrinsic impedance ?

PART – B (5×13=65 Marks)

11. a) i) A charge 20 μ C is located at A(– 6,4,7) and another charge 50 μ C is at B(5, 8, –2) in free space. If distances are given in metres, determine the vector force exerted by the first charge on the second one. (4)

ii) A 50 cm length coaxial cable having an inner radius 1 mm and an outer radius 4 mm, has its inner space between the conductors filled with air. The total charge on the inner conductor is 30 nC. Find the charge density on each conductor. (4)

iii) State the divergence theorem and explain its significance. (5)

(OR)

b) i) A charge of 0.3 μC is located at A(25, – 30, 15) (in cm) and a second charge of 0.5 μ C is at B(–10, 8, 12) cm. Find the Electric field intensity at the origin. (4)

ii) Find the total charge enclosed in an incremental volume of 10^{-9} m^3 located at the origin, if $D = e^{-x} \sin ya_x + 2za_z$ C/m^2. (4)

iii) State Gauss's law and give any two of its applications. (5)

12. a) i) State and prove electrostatic boundary conditions. (7)

ii) Describe the concept of dielectric polarization. (6)

(OR)

b) i) Derive the energy density of capacitance. (7)

ii) Discuss in detail, the electric field in multiple dielectrics. (6)

13. a) i) Derive the H due to current 'I' flowing in a circular loop. (6)

ii) State and prove magnetostatic boundary conditions. (7)

(OR)

b) i) Describe magnetic materials. (5)

ii) Compare and contrast scalar and vector potentials. (4)

iii) Define Torque and Magnetic force. (4)

14. a) Derive all the Maxwell's equations, in both differential and integral form. (13)

(OR)

b) i) Describe the function of a transformer starting from fundamental principles. (6)

ii) Describe the applications where circuit theory is used and applications, where field theory is used. (7)

15. a) i) Derive wave equation from Maxwell's equations. (7)

ii) Describe the wave propagation in free space. (6)

(OR)

b) i) Describe plane wave reflection. (7)

ii) Derive Poynting vector and state its significance. (6)

PART – C (1×15=15 Marks)

16. a) Consider an Antenna radiating signals from a Transmitter section. Also, there exists an Amplifier which is actually used in a Receiver section to boost the very weak signals. Compare the role played/not played by Field theory and/or Circuit theory in both these electronic equipments. Clearly bring out a deeper analysis of both the modules with the relevant theory. Hence validate "Both field theory and circuit theory are equally important".

(OR)

b) Clearly bring out the distinction between a 'Standing wave' and a 'propagating wave'. What difference does it mean, in terms of power flow given by Poynting vector in both these kinds of waves ? In detail, bringout the concepts behind the two waves. Is standing wave finding an application anywhere ? Why ?

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