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

Question Paper Code: 50443

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Electronics and Communication Engineering

15UEC403 - ELECTROMAGNETIC FIELDS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The force between two charges is 120 N. If the distance between the charges is doubled, the force will be

   (a) 60 N (b) 30 N (c) 40 N (d) 15 N

2. Fleming's left hand rule is used to find

   (a) direction of magnetic field due to current carrying conductor
   (b) direction of flux in a solenoid
   (c) direction of force on a current carrying conductor in a magnetic field
   (d) polarity of a magnetic pole

3. If three 10 µ F capacitors are connected in parallel, the net capacitance is

   (a) 20 µF (b) 30 µF (c) 40 µF (d) 50 µF

4. The direction of induced e.m.f. can be found by

   (a) Laplace's law (b) Lenz's law
   (c) Fleming's right hand rule (d) Kirchhoff s voltage law

5. Electromagnetic waves carry

   (a) positive charge (b) negative charge
   (c) no charge (d) both positive and negative charge

PART - B (5 x 3 = 15 Marks)

6. State Gauss's law.

7. Recall the concept of magnetic torque.

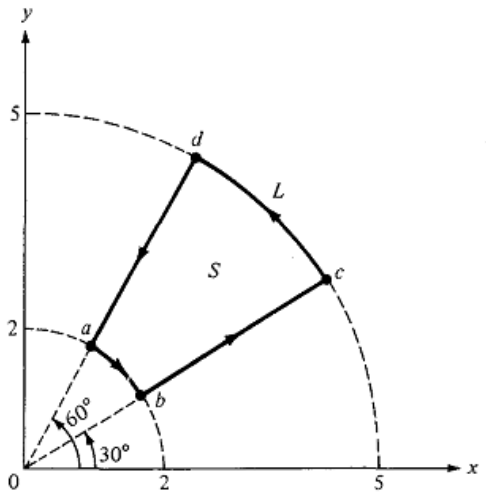
8. Write point form of ohm's law.

9. Define Poynting vector.

10. Write short note on uniform plane waves.

PART - C (5 x 16 = 80 Marks)

11. (a) If $A=\rho\cos\phi\, a_\rho + \sin\phi\, a_\phi$, evaluate closed line integral of A around the path shown in below figure and confirm this by stokes theorem. (16)



Or

(b) Derive the electric field intensity equation for the finite line charge. (16)

12. (a) Determine magnetic field intensity of infinitely long coaxial transmission line. Use ampere circuital law. (16)

Or

(b) (i) Write a short note on Biot Savart's law (8)

(ii) Derive an expression for force between two current carrying conductors. (8)

13. (a) (i) Calculate the self-inductance per unit length of an infinitely long solenoid. (8)

(ii) Derive the expression for capacitance of a coaxial capacitor. (8)

Or

(b) Derive the boundary conditions of the normal and tangential components of electric field at the interface of two media with different dielectrics. (16)

14. (a) Derive Maxwell's equations in differential and integral forms. (16)

Or

(b) State and prove Poynting theorem. Write the expression for instantaneous, average and complex pointing vector. (16)

15. (a) Derive the wave equation from Maxwell's equation. Give the illustration for plane waves in good conductors. (16)

Or

(b) A uniform plane wave in air with $E = 8 \cos(\omega t - 4x - 3z)\, a_y$ V/m is incident on a dielectric slab ($z \geq 0$) with $\mu_r = 1.0$, $\varepsilon_r = 2.5$, $\sigma = 0$. Find

(a) The polarization of the wave

(b) The angle of incidence

(c) The reflected E field

(d) The transmitted H field (16)
