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

Question Paper Code: 51333

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Third Semester

Electrical and Electronics Engineering

15UEE303 - FIELD THEORY

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. ∇^2 is

   (a) Vector (b) Scalar (c) Depend on direction (d) None

2. Which of the following is zero?

   (a) grad div (b) div grad (c) curl grad (d) curl curl

3. The electric field intensity at a point is situated 4 *meters* from a point charge is 200 *N/C*. If the distance is reduced to 2 *meters*, the field intensity will be

   (a) 400 *N/C* (b) 600 *N/C* (c) 800 *N/C* (d) 1200 *N/C*

4. The plate of a parallel plate capacitor after being charged from a constant voltage source are separated apart by means of insulated handles, then the

   (a) voltage across the plate increases (b) voltage across the plate decreases
   (c) charge on capacitor increases (d) charge on capacitor decreases

5. One of the following is not a source of magneto static fields

(a) A direct current in a wire
(b) A permanent magnet
(c) An accelerated charge
(d) An electric field linearly changing with time

6. For static magnetic field Maxwell's curl equation is given by

(a) $\nabla . \vec{B} = \mu_0 \vec{J}$ (b) $\nabla \times \vec{B} = 0$

(c) $\nabla \times \vec{B} = \mu_0 \vec{J}$ (d) $\nabla \times \vec{B} = \mu_0 / \vec{J}$

7. Which of the following laws of electromagnetic theory is associated with the force experienced by two loops of a wire carrying currents?

(a) Maxwell's law (b) Coulomb's law
(c) Ampere's law (d) Laplace's law

8. Static electricity is produced due to

(a) friction (b) conduction (c) induction (d) both (a) and (c)

9. Poynting vector is associated with which of the following?

(a) power flow in electromagnetic (b) flux in magnetic field
(c) charge in electrostatic field (d) current in electrostatic field

10. An electromagnetic wave is incident normally on a dielectric boundary. It is

(a) totally reflected (b) partially reflected and partially refracted
(c) totally absorbed (d) none of the above

PART - B (5 x 2 = 10 Marks)

11. What are the source of electric field and magnetic fields?

12. List any two applications of Guass's law.

13. State Biot-Savart's law.

14. Write Maxwell's equation in point and integral form for good conductors.

15. Give typical examples of electromagnetic waves.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Verify, whether the vector field $A = yz\overrightarrow{a_x} + zx\overrightarrow{a_y} + xy\overrightarrow{a_z}$ is irrotational and solenoid. (8)

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

Or

(b) (i) State and prove Stoke's theorem. (8)

(ii) If $\vec{C} = 3y^2\overrightarrow{a_x} + 4z\overrightarrow{a_y} + 6y\overrightarrow{a_z}$ verify Stock's Theorem for the open surface $z^2 + y^2 = 4$ in the $x = 0$ plane. (8)

17. (a) (i) A circular disc of radius '*a*' *m* is charged uniformly with a charge density of σ c/m^2. Find the electric field intensity at a point *'h' m* from the disc along its axis. (10)

(ii) Drive the Poisson's and Laplace equation. (6)

Or

(b) (i) Deduce an expression for the capacitance of a parallel plate capacitor with two dielectrics of relative permittivities ε_1 and ε_2 respectively interposed between the plates. (8)

(ii) Determine the electric field intensity at *P* (-0.2, 0, -2.3) due to a point charge of 5 *nc* at *Q* (0.2, 0.1, -2.5) in air. (8)

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

(ii) Derive the boundary condition for magnetic field. (8)

Or

(b) (i) Obtain the expression for magnetic field intensity at any points due to in straight conductors. (12)

(ii) Two wires carrying current in the same direction if 500 *A* and 800 *A* are placed with their axis 6 *cm* apart. Calculate the force between them. (4)

19. (a) Write down the Maxwell's equation in differential as well as integral forms. Explain their significance. (16)

Or

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

(ii) Mention the relation between field theory and circuit theory. (6)

20. (a) Drive the expression for velocity, attenuation constant, phase constant, intrinsic impedance constant, wavelength for an electromagnetic wave in free space. (16)

Or

(b) Drive an expression for reflection and transmission coefficient of a plane wave at normal incidence. (16)