Register Number .....

B.E. DEGREE EXAMINATIONS: OCTOBER / NOVEMBER - 2008

Third Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U07EE301 - Electromagnetic Theory

Time: Three Hours **Maximum Marks: 100**

Answer ALL questions: -

PART A (20 X 1= 20 Marks)

1. An orthogonal system is one in which the coordinates are _____

a) Parallel
b) Tangential
c) Mutually perpendicular
d) Normal to the surface

2.Determine the divergence of the vector field $P = x^2yz\ a_x + xz\ a_z$

a) xyz + x
b) 2xyz
c) 3x
d) 2xyz + x

3. Find the force on a charge $Q_2 = 10\ \mu C$ at a point (2,0,0) by a charge $Q_1 = 20\mu C$ at point (1,0,0) in free space is ----------

a) 1.8N
b) 2.1N
c) 2.5N
d) 1.1N

4.Cartesian coordinate system is also called as _____

a) Rectangular coordinate system
b) Cylindrical coordinate system
c) Spherical coordinate system
d) Ellipsoidal coordinate system

5. The vectors, which lie in the same plane, are called _____

a) Coplanar vectors
b) Tangential vectors
c) Unit vector
d) Normal vector

6. The main use of Gauss's law is to find _____

a) Electric potential
b) Potential difference
c) Electric field intensity
d) Energy density

7. Poisson's and Laplace's equation are useful for determining _____

a) Electrostatic potential
b) Electric Field intensity
c) Electric flux density
d) Dipole moment

8. Which of the following statements are incorrect?

a) The conductivities of the conductors and insulators vary with temperature and frequency.
b) A conductor is an equipotential body and E is always tangential to the conductor
c) Non polar molecules have no permanent dipoles
d) In a linear dielectric, P varies linearly with E.

9. The general form of Biot-Savart's Law is given by _____

a) $dB = Idlsin0/ 4\Pi r^2$
b) $dB = \mu Idlcos\theta/ 4\Pi r^2$
c) $dB = \mu Idlsin\theta/ 4\Pi r^2$
d) $dB = \mu Idlsin\theta/ 4\Pi r$

10. The point form of Ampere's law is given by _____

a) Del * J = H
b) Del * H = B
c) Del * B= H
d) Del * H = J

11. A circular coil of radius 2 cm carries a current of 4 A what is the value of magnetic field inten
at the centre.

a) 1A/m
b) 10A/m
c) 100A/m
d) 1000A/m

12. The _____ of field intensity 'H' is continuous across the boundary.

a) Normal component
b) Tangential component
c) Linear component
d) Non-linear component

13. The electromotive force around a closed path is equal to the magnetic displacement through th
closed path. This is called _____

a) Maxwell's equation in point form from Ampere's law
b) Maxwell's equation in integral form from Ampere's law
c) Maxwell's equation in integral form from Faraday's law
d) Maxwell's equation in differential form from Faraday's law

14. The displacement current density is given by _____

a) $J = \partial\rho/\partial t$
b) $J = \partial E/\partial t$
c) $J = \partial D/\partial t$
d) $J = \partial Q/\partial t$

15. ---------- components are involved in Field theory.

a) Lumped
b) Distributed
c) Two dimensional
d) Low power

16.An example of motional emf is----------

a) Generator
b) Two winding transformer
c) Auto transformer
d) Three phase transformer

17. The electromagnetic wave equation for magnetic field is given by _____

a) $Del^2 H - \mu\partial H/\partial t - \mu\epsilon\, \partial^2 H/\partial t^2 = 0$
b) $Del^2 H - \mu\sigma\, \partial H/\partial t - \mu\epsilon\, \partial^2 H/\partial t^2 = \rho$
c) $Del^2 H - \mu\sigma\, \partial H/\partial t - \mu\partial^2 H/\partial t^2 = 0$
d) $Del^2 H - \mu\sigma\, \partial H/\partial t - \mu\epsilon\, \partial^2 H/\partial t^2 = 0$

18. Poynting vector states that the vector product of _____ at any point is a mea
of the rate of energy flow per unit area at that point.

a) Electric flux density and magnetic field intensity
b) Electric field intensity and magnetic flux density
c) Electric field intensity and magnetic field intensity
d) Electric flux density and magnetic flux density

19. The velocity of uniform plane wave in a loss-less dielectric is $1 * 10^8$ m/s. Find the dielectric constant.

a) 9 b) 8 c) 6 d) 7

20. For good dielectric $\sigma/\omega\varepsilon$ is _____

a) Unity
b) Less than unity
c) Greater than unity
d) Zero.

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PART A (5 X 16 = 80 marks)

21.a. (i) State and prove Strokes theorem.

(ii) What are the major sources of electromagnetic fields?

(OR)

21. b. (i) Discuss about Curl of a vector.

(ii) Derive an expression for Curl of a vector.

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22.a. State and prove Gauss law. State its application.

(OR)

22.b.(i) Derive Laplace and Poisson's equations.

(ii) A capacitor consists of squared two metal plates each 100 cm side placed parallel and 2 mm apart. The space between the plates is filled with a dielectric having a relative permittivity of 3.5. A potential drop of 500 V is maintained between the plates. Calculate 1) the capacitance 2) the charge of capacitor 3) the electric flux density and 4) the potential gradient.

23.a.(i) With a suitable diagrams, derive the boundary conditions between the two magnetic materials having different permeability's.

(ii) Evaluate the inductance of a solenoid of 2500 turns wound uniformly over a length of 0.5 m on a cylindrical paper tube 4 cm in diameter with a medium is air.

(OR)

23.b(i) Obtain an expression for the magnetic field intensity due to infinitely thin long wire carrying current **I** at a distance **R.**

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(ii) Derive for force and torque in a magnetic field using motor as an example.

24.a. Derive the Maxwell's equation in differential and integral form.

(OR)

24. b.(i) Write short notes on Faraday's laws of electro magnetic induction.

(ii) A parallel plate capacitor with plate area of $5m^2$ and plate separation of 3 mm has voltag sin 10^3 t V applied to its plates. Calculate the displacement current. Assume $\varepsilon = 2\varepsilon_0$.

25. a. Derive the electro magnetic wave equation in frequency domain. Derive the expression for intrinsic impedance and propagation constants for free space, dielectric and conductor.

(OR)

25. b.(i) Define pointing vector. Mention its physical significance.

(ii) A metal sheet of aluminium has $\sigma = 38.2$ Mega mho/m and $\mu r = 1$. Calculate the skin de the propagation constant and velocity of propagation at the frequency of 1.6 MHz.

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