Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) EXAMINATION – SUMMER 2016

Subject Code:2140909 Date:06/06/2016

Subject Name:Field Theory

Time:10:30 AM to 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

MARKS

Q.1 Short Questions **14**

1 Emf is closed _____ integral of non-conservational electric field that is generated by battery.
(a) Line (b) Surface (c) volume (d) None of these

2 Maxwell's equations shelter on _____ law(s).
(a) Faraday's (b) Gauss's (c) Ampere's (d) All of these

3 The cross product of the same vector to itself is _____.
(a) 0 (b) 1 (c) ∞ (d) 100

4 In the case of a linear material medium, _____ equation can be derived easily from Gauss' law.
(a) Poisson (b) Laplace (c) Both (a) and (b) (d) None of these

5 Another boundary condition using Maxwell's equations is given as _____.
(a) $H_{tan\,'1'} + H_{tan\,'2'} = 0$ (b) $H_{tan\,'1'} - H_{tan\,'2'} = 0$ (c) $H_{tan\,'1'} + H_{tan\,'2'} = J_s$ (d) $H_{tan\,'1'} - H_{tan\,'2'} = J_s$

6 At the Brewster angle, polarization _____.
(a) Cannot be reflected (b) Is reflected at 30°
(c) Is reflected at 90° (d) None of these

7 The divergence of  is _____
(a) scalar (b) vector (c)curl of F(d) none of this

8 Write down Streamlines equation of electric field intensity for (r, θ, Φ) and (ρ, Φ, z)

9 State of the Ampere circuital law.

10 Write down equation for  ,  and  for spherical coordinate system.

11 Cylindrical coordinate 'z' is related to the Cartesian coordinate as _____.
a) $\tan^{-1}(y/x)$ (b) z (c) xy/z (d) cot z

12 Wave attenuation is given as _____.
a) $e^{+\beta x}$ (b) $e^{-\beta x}$ (c) $e^{+\alpha x}$ (d) $e^{-\alpha x}$

13 In good conductors, rate of attenuation is _____.
a) Small (b) Large (c) Infinity (d) Zero

14 As per Gauss' Law, charge density inside a perfect conductor is zero if E is _____.
a)Positive (b) Negative (c) Unity (d) Zero

Q.2 **(a)** Give the importance of unit vectors. And discuss the concepts of differential surface vector. **03**

(b) State and explain the gauss's law **04**

(c) Express for electric field intensity at any point to a line charge with uniform charge density ρ_L C/m on the infinitely long Z-axis. **07**

OR

(c) Given points A (x = 2 , y = 3, z = -1) and B (ρ=4,ϕ=-50^0,z=2). Find a unit vector in Cylindrical coordinate **07**
(a)At point B directed towards point A
(b) At point A directed towards point B

Q.3 **(a)** Derive Poisson's and Laplace's equation. **03**

(b) Write a short note on sources of EMI. **04**

(c) Draw the figure for the orthogonal system which has its second coordinate is angle made by cone and z- axis. Transform the co-ordinates of this system in to Cartesian co-ordinate **07**

OR

Q.3 **(a)** What are advantages of transmission lines? What are the most commons type of transmission lines? **03**

(b) State coulomb's law of electric for various type of charge distribution. **04**

(c) A 60 ohm distortion less transmission line has a capacitance of 0.15 nF/m. The attenuation on the line is 1.15 X 10^{-3} Np/m. calculate: **07**

(a) the line parameter: resistance, inductance and conductance per meter of the line,
(b) The velocity of wave propagation.
(c) voltage at distance of 1km and 4km with respect to sending- end voltage

Q.4 **(a)** Explain concept of scalar magnetic potential and magnetic vector potential. **03**

(b) Write and explain differential and integral forms of Maxwell's equation. **04**

(c) Derive and explain continuity equation for steady current. **07**

OR

Q.4 **(a)** Derive the expression curl H = J. **03**

(b) Define the potential gradient. Derive relationship between potential and electric field intensity. **04**

(c) A Point charge of 16 nC is located at Q (2, 3, 5) in free space, and a uniform line charge of 5 nC/m is at the intersection of the planes x = 2 and y = 4. If the potential at the origin is 100V, find V at Point P (4, 1, 3). **07**

Q.5 **(a)** Explain spherical coordinate system in brief. Also write the equations of differential length, differential surfaces and differential volume elements. **03**

(b) Expression for the torque on a differential current loop in a magnetic field β when force and torque on a closed circuit. **04**

(c) State and explain Biot-sawart's law for static magnetic fields as applied to different types of current distribution. **07**

OR

Q.5 **(a)** Derive equation of energy stored in magnetic fields. **03**

(b) State and explain ampere's circuit law both in integral differential form as used in magnetic field **04**

(c) A triangle is defined by the three points A (2,-5, 1), B (-3, 2, 4), and C (0, 3, 1) Find: (a) $\vec{R}_{AB} \times \vec{R}_{AC}$; (b) The area of the triangle; (c) A unit vector perpendicular to the in which the triangle located. **07**

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