Seat No.: _____  Enrolment No. 

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018**

**Subject Code:2140909** **Date:10/12/2018**

**Subject Name:Field Theory**

**Time: 02:30 PM TO 05:00 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** | **(a)** | State and Explain Coulomb's law | **03** |
| | **(b)** | Define unit vector and explain it in each co-ordinate system. | **04** |
| | **(c)** | Explain spherical co-ordinate system and give relationship between Cartesian and spherical co-ordinate system. | **07** |
| **Q.2** | **(a)** | State parameters of transmission line and give difference between lumped parameters and distributed parameters. | **03** |
| | **(b)** | State and explain Gauss's law. | **04** |
| | **(c)** | Explain Physical meaning of divergence and state it's properties. | **07** |
| | | **OR** | |
| | **(c)** | Obtain equation for flux density due to infinite line charge using Gauss's law | **07** |
| **Q.3** | **(a)** | Explain Electrical dipole. | **03** |
| | **(b)** | Explain phenomenon of polarization. | **04** |
| | **(c)** | Two uniform line charges of density $\rho_l$ = 4nc/m lie on the x=0 plane and $Y = \pm 4$ are parallel to Z-axis. Find E at (4,0,10) m. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Define conservative field. | **03** |
| | **(b)** | State Maxwell's equation in point form and integral form for static electromagnetic field. | **04** |
| | **(c)** | A dielectric-free space interface has the equation $3x + 2y + z = 12\ m$.The origin side of the interface has $\in_n = 3.0$ *and* $E_1 = 2\overline{a_x} + 5\overline{a_z}$ v/m. Find $E_2$ . | **07** |
| **Q.4** | **(a)** | Define displacement current and current density. | **03** |
| | **(b)** | State and Explain Ampere circuit law. | **04** |
| | **(c)** | Derive the expression for potential difference duce to infinite line charge. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Write Effect of Electromagnetic Interference. | **03** |
| | **(b)** | State and explain Stoke's Theorem. | **04** |
| | **(c)** | Define relaxation time and derive equation for Relaxation time. | **07** |
| **Q.5** | **(a)** | Explain difference between steady magnetic field and time varying magnetic field. | **03** |
| | **(b)** | Let $V_1(r,\theta,\emptyset) = \frac{6}{r}$ and $V_2(r,\theta,\emptyset) = 3$. State weather $V_1, V_2$ satisfied Laplace's equation. | **04** |
| | **(c)** | Derive transmission line equation with help of equivalent circuit. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Write sources of Electromagnetic Interference. | **03** |
| | **(b)** | A circular loop located on $x^2 + y^2 = 25$, Z=0 carries a direct current of 10 A along $\overline{a_\emptyset}$ .Determine $\overline{H}$ at (0,0,4) and (0,0,-4) | **04** |
| | **(c)** | State and Explain Lorentz force equation on charged particles. | **07** |

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