

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

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|------------|--|-----------|
| 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 its 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 $\rho_l = 4\text{nc/m}$ 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 $3x + 2y + z = 12\text{ m}$. The origin side of the interface has $\epsilon_n = 3.0$ and $E_1 = 2\bar{a}_x + 5\bar{a}_z$ 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 due 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 $V_1(r, \theta, \phi) = \frac{6}{r}$ and $V_2(r, \theta, \phi) = 3$. State whether 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 $\bar{a}_\phi$. Determine $\bar{H}$ at (0,0,4) and (0,0,-4) | 04 |
| | (c) State and Explain Lorentz force equation on charged particles. | 07 |
