

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-V Examination-Nov/Dec.-2011

Subject code: 151002**Date: 26/11/2011****Subject Name: Engineering Electromagnetics****Time: 2.30 pm -5.00 pm****Total marks: 70****Instructions:**

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

Q.1 (a) Define electric field intensity. Derive the expression for the intensity of electric field due a line charge along the Z direction with uniform charge density ρ_L c/m using Coulomb's law and verify the same using Gauss's law. **07**

(b) Express in cylindrical components: (a) the vector from C(3,2,-7) to D(-1,-4,2); (b) a unit vector at D directed towards C; (c) a unit vector at D directed toward the origin. **07**

Q.2 (a) State and prove the Gauss's law. Also state the conditions to be satisfied by the special Gaussian surfaces. **07**

(b) A uniform line charge density of 20 nC/m lies on the Z-axis between Z=1 and Z=3 m. No other charge is present. Find electric field intensity at : (a) the origin (b) P (4,0,0). **07**

OR

(b) Find the total charge inside each of the volumes indicated. **07**

(a) $\rho_v = 10z^2 e^{-0.1x} \sin \pi y$, $-1 < x < 2$, $0 < y < 1$, $3 < z < 3.6$.

(b) $\rho_v = 4xyz^2$, $0 < \rho < 2$, $0 < \phi < \pi/2$, $0 < z < 3$.

(c) $\rho_v = 3\pi \cos^2 \theta \cos^2 \phi / [2r^2 (r^2 + 1)]$; Universe.

Q.3 (a) Enlist Maxwell's equations in integral form and explain their physical significance. **07**

(b) Derive Laplace's and Poisson's equations and states their key applications. **07**

OR

Q.3 (a) If $V = 60 \sin \theta / r^2$ volt in the free space and point P is located P(3, 60°, 25°). **07**

Find (a.) V_p (b.) E_p (c.) dV/dN at P (d.) a_N at P (e.) ρ_v at P.

(b) Assuming the potential function V varies as a function of ρ in cylindrical coordinates systems, obtain the solution of Laplace equation and deduce the value of capacitance of a coaxial capacitor **07**

Q.4 (a) Using Gauss's law explain the concept of divergence. Prove Divergence theorem and obtain Maxwell's first equation **07**

(b) State and explain Biot-Savart's law. **07**

OR

Q.4 (a) Explain in details the Electrostatic boundary conditions between perfect dielectrics. **07**

Q.4 (b) An aluminium conductor is 1000 ft long and has a circular cross **07**

