EC 508 **Roll No.** | | | | | | | | | | |

B.Tech.
(SEM V) ODD SEMESTER EXAMINATION 2015-16
FUNDAMENTALS OF EM THEORY

[Time: 2 hrs.] **[Max. Marks: 50]**

1. Attempt any FOUR of the following questions: (3.5x4=14)

(a) Given that vector M=-10a_x + 4a_y-8a_z and N=8a+7a_y-2a_z . Find (a) a unit vector in the direction of –M+2N, (b) magnitude of 5a_x+N-3M, (c) |M| |2N|(M+N).
(b) Express the vector that extends from point P (-3,-4, 5) to Q (2, 0,-1) in (a) rectangular coordinates (b) cylindrical coordinates system.
(c) Explain the physical significance of divergence and curl.
(d) State and explain coulomb's law. Calculate the electric field intensity at point (1,1,1) by four identical point charges of 3nC located at (1,1,0), (-1,1,0), (-1,-1,0) and (1,-1,0).
(e) Find gradient of V= $2\rho^3 z \cos 2\varphi$.
(f) What is Gauss's law? Give the applications of Gauss's law.

2. Attempt any Two parts of the following questions: (6x2=12)

(a) Drive the expression for the capacitance of a coaxial capacitor. Determine the capacitance of a parallel plate capacitor of area 16 cm2, separate 8cm, when a mica sheet of thickness 2cm with ε_r =10 is inserted between the paths of the capacitor.
(b) State and explain the Poisson's and Laplace's equation.
(c) Describe the boundary condition in electrostatic field for (a) dielectric-dielectric boundry (b) conductor –dielectric (c) conductor and free space.

3. Attempt any TWO of the following questions: (6x2=12)

a) State biot- savart's law and drive an expression for magnetic field intensity due to infinite straight line current carrying wire.
b) Describe the magnetic boundary condition. Let us assume that μ1=4μ H/m in region 1where Z>0, while μ2=7μ H/m in region 2 for Z<0, Let K=80ax A/m on the surface z=0. Establish a field B1= 2ax-3ay+az mT in region 1 find the value of B2 in region 2.
c) State and explain Maxwell's equation in both differential and integral form for time varying field and also discussed its physical significance.

4. Attempt any TWO of the following questions: (6x2=12)

a) Derive the wave equation for free space.
b) Derive expression for the attenuation constant α and phase shift constant β.
c) For uniform plane wave in sea water,find the value of Attenuation Constant, Phase Constant, Intrinsic impedance and wavelength at 10^5 MHz. Given that σ = 4 mho/m and $\epsilon = 80\ \epsilon_0$ and $\mu = \mu_0$