Roll No .....

EC - 402

B.E. IV Semester

Examination, June 2014

Electro-Magnetic Theory

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Describe difference between the directance and gradient. 2

   b) What is curl? Define and explain. 2

   c) Describe coulomb's law. 3

   d) Consider a charge $Q_1 = 3\times10^{-4}C$ at P_1 (1,2,3) and charge on $Q_2 = -10^{-4}C$ at P_2 (2, 0, 5) in the vacuum then find force F_2 on Q_2. 7

OR

Find the total charge inside the volume as indicated below.

$Pv = 4xyz^2$

for $0 \le P \le 2$

$0 \le \phi \le \pi/2$

$0 \le z \le 3$

Unit - II

2. a) State Biot Savart law. 2

   b) Describe ampere circuital law. 2

   c) State and explain stokes theorem. 3

   d) Derive for $\overline{H}$ in ϕ case of ∞ long current carrying conductor. 7

OR

A circular loop located on $x^2 + y^2 = 9$, z=0, carrying a d.c 10Amp. current along a $\overline{a\phi}$ determine $\overline{H}$ at (0,0,4)

Unit - III

3. a) Write all the Maxwell's equation in the point form. 2

   b) Write all the Maxwell's equation in the integral form. Also write their statement. 2

   c) What is significance of the displacement current? Write. 3

   d) What do you mean by pointing vector? State for duality theorem. 7

OR

The magnetic field intensity of a uniform plane wave in air is 20A/m in the $\overline{ay}$ direction.

The wave is propagating in the $\overline{a_z}$ direction at a frequency of 2 grad/s (2×10^9 rad/sec)

Find (*a*) λ (*b*) *f*

Unit - IV

4. a) Write a types of the polarization. What is polarization? 2

   b) Define loss tangent and skin depth. 2

   c) Derive for the B in case of the wave motion in the perfect dielectric. 3

   d) Given a non magnetic material having $\epsilon_r = 2.25$ and $\sigma = 10^{-4}$ mhos/m, find loss tangent and attenuation constant at 2.5 MHz. 7

OR

Derive for the poynting vector.

Unit - V

5. a) Define critical and Brewsters angle. 2

   b) Define group and phase velocity. 2

   c) Define electric vector potential magnetic vector potential and retarded potential. 3

   d) Describe reflection coefficient and transmission coefficient in case of uniform. Plane wave at normal incidences. 7

OR

A uniform plane wave is incident on the from air on to glass at an angle from the normal of 30°. Determine the fraction of the incident power that is reflected and transmitted for

i) P-polarization and

ii) S-Polarization

Glass has refractive index $h_2 = 1.45$.