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**MEMT - 102****M.E./M. Tech., I Semester**

Examination, June 2014

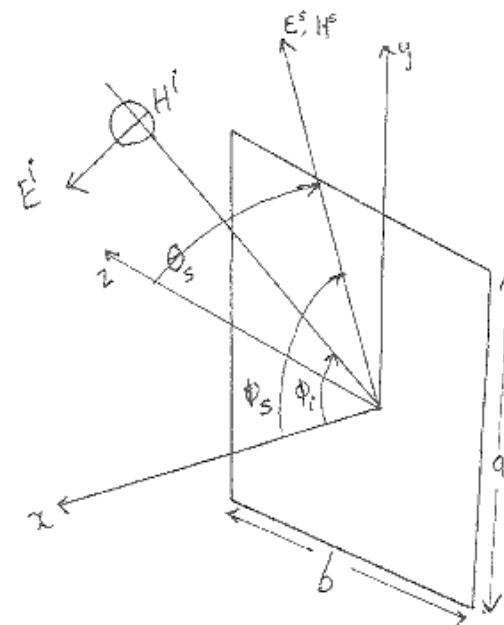
**Electromagnetic Field Theory***Time : Three Hours**Max. Marks : 70**Note:* i) Attempt any five questions.

ii) Assume suitable data wherever necessary.

1. a) Derive the Green's function for a two-dimensional field satisfying the Helmholtz equation in a homogeneous medium with the radiation boundary condition at infinity.  
b) Explain the Lorentz reciprocity theorem and the reciprocity theorem for impressed sources.
2. Derive wave functions, zeroes and infinities for radial waves in spherical co-ordinates?
3. a) Explain the higher order modes on co-axial lines?  
b) Discuss the following:
  - i) The scalar Green's theorems
  - ii) The vector Green's theorems
4. Parallel polarized uniform plane wave on the xy-plane in a free-space medium is obliquely incident upon a rectangular, flat, perfectly conducting ( $\sigma = \infty$ ) plate as shown in figure. The dimensions of the plate are 'a' in the Y direction and 'b' in

the Z direction. Find the electric and magnetic fields scattered by the flat plate assuming that observations are made in the far zone. Solve the problem by using the Induction equivalent and physical equivalent make appropriate simplifications and compare the results.

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Plane wave scattering from a flat rectangular conducting plate.

5. Briefly explain field equivalence principles?
6. Correlate Green's function with Poisson's equation mathematically.
7. Enumerate the boundary conditions and field behavior in source regions.
8. Give a mathematical analysis of the orthogonal properties of the modes?