

Code: ECMC1T1

I M.Tech - I Semester - Regular Examinations – April 2015

**TIME HARMONIC ELECTRO MAGNETIC FIELDS
(MICROWAVE & COMMUNICATION ENGINEERING)**

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Explain the AC Characteristics of Matter. 7 M

- b) A small capacitor has a dc capacitance of $300\mu\text{F}$ when air filled. When it is oil filled, it is found to have an impedance of $(500-j)\times 10^3$ at $\omega=10^6$. Determine the \hat{y} , ϵ' , ϵ'' of the oil, neglecting conductor losses. 7 M

2. a) Explain the behavior of Waves in lossy matter. 7 M

- b) Compare transmission line wave to uniform plane waves. 7 M

3. a) Show that a source in unbounded space is characterized by a radiation of energy. 7 M

- b) For the TE_{01} rectangular waveguide mode, show that the time average electric and magnetic energy per unit length are $\overline{W}_e = \overline{W}_m = \frac{\epsilon_0}{4} |E_0|^2 ab$ 7 M

4. a) Explain in detail about Image theory. 7 M
- b) Obtain the solutions to boundary value problems for which the field in Half-Space using tangential Components over the boundary plane. 7 M
5. a) Derive the integral equation in terms of vector potential A and F. 7 M
- b) State and Explain the Reaction theorem. 7 M
6. a) Explain the fields of rectangular Cavity as TE mode in x, y, z Coordinates. 7 M
- b) Given the tangential Components of E or H over a wave guide cross section. Determine the amplitudes of various waveguide modes using modal expansions of fields. 7 M
7. a) Briefly describe about circular cavity. 7 M
- b) Explain the Concept of three dimensional radiations. 7 M
8. a) Derive the necessary orthogonality relationship using Green's theorem. 7 M

b) Consider an air filled Spherical resonator of radius 10cm bounded by copper walls. Determine the first five resonant frequencies and the Q of the dominant mode. 7 M