Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B.Tech.

Branch	**: ECE**	**Semester**	**: 6th**
Title of the Course	**:Antenna and wave propagation**	**Course Code**	**:EC352**

Time: 2 Hours **Maximum Marks: 30**

Note:

- **Questions are printed on BOTH sides.Answers should be CLEAR, TO THE POINT AND LEGIBLE.**
- **All parts of a single question must be answered together and in the same sequence as given in question paper. ELSE QUESTION SHALL NOT BE EVALUATED.**

Q1.Show that$\omega\mu = \kappa\eta$, where the symbols have their usual meaning. 3

Q2. Can an electric bulb in home work as an antenna? If yes how, if no give the reasons? 3

Q3. The maximum gain of a horn antenna is +20dB, while the gain of its first sidelobe is -15dB. What is thedifference in gain between maximum and first side lobe: 3

a) in dB

b) as a ratio of the field intensities.

Q4. A uniform plane wave is incident upon a very short lossless dipole ($l<<<\lambda$).find the maximum effective area assuming that radiation resistance of the dipole is R_r, and the incident field is linearly polarized along the axis of dipole. 3

Q5. A $\lambda/2$ dipole, with a total loss resistance of 1 ohm, is connected to a generator whose internal impedance is 50+j25 ohms. Assuming that the peak voltage of the generator is 2Vand the impedance of the dipole, excluding the loss resistance, is 73+j42.5 ohms, find the power 4

a) supplied by the source(real)

b) radiated by the antenna

c) dissipated by the antenna

Q6. The far-zone electric field intensity of an end fire two element array antenna, placed along the z-axis and radiating into free space, is given by 5

$$E=\cos[\pi/4(\cos\theta-1)]e^{-jkr}/r, \qquad 0\leq\theta\leq\pi$$

Find the directivity using Kraus' formula.

Q7. A centre fed electric dipole of length l is attached to a balanced lossless transmission line whose characteristic impedance is 50 ohms. Assuming the dipole is resonant at the given length, find the input VSWR when 4

(a) $l=\lambda/50$ (b) $l=\lambda/4$ (c) $l=\lambda/2$ (d) $l=3\lambda/4$ (e) $l=0.01\lambda$

Q8. A $\lambda/2$ dipole situated with its centre at the origin radiates a time average power of 600W at a frequency of 300MHz. A second $\lambda/2$ dipole is placed with its centre at appoint $P(r,\theta,\phi)$, where r=200 m, $\theta=90^{o},\phi=40^{o}$. It is oriented so that its axis is parallel to that of the transmitting antenna. What is the available power at the terminals of the second dipole? **5**