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Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech 3rd year

Branch : ECE | Semester: Vth

Title of the Course : Antenna and wave propagation | Course Code: ECL-301

Time: 2 Hours | Maximum Marks: 25

Note : **Attempt all questions**

Q.1 An antenna has a field pattern given by $E(\theta) = cos\theta\ cos2\theta$ for $0° \leq \theta \leq 90°$. Find

(a) The half power beamwidth (HPBW)

(b) Beamwidth between first nulls (FNBW). [6]

Q.2 Design a rectangular microstrip antenna using a substrate with dielectric constant of 2.2, h = 0.1588 cm (0.0625 inches) so as to resonate at 10 GHz. [5]

Q.3 What are the suitable conditions required for any metallic structure to be radiate into space? [2]

Q.4 If an antenna operating over the frequency range of 1 GHz to 7 GHz, then what will be its fractional bandwidth? [2]

Q.5 Why the effective dielectric constant (ε_e) is less than actual dielectric constant of the substrate (ε_r) [2]

Q.6 How the large antenna's width (W) is responsible for wider impedance bandwidth (BW)? [2]

Q.7 If the frequency of operation is increased, the radiation of antenna will increased or decreased ? Justify your answer with a specific reason. [2]

Q.8 What are the major limitations of the microstrip patch antenna. [2]

Q.9 For an antenna application the dielectric constant and height of the substrate should be ..... and ....., respectively. [1]

Q.10 Radiation of the antenna is determined by fringing field between ..... [1]

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{reff} + 0.3)\left(\frac{W}{h} + 0.264\right)}{(\epsilon_{reff} - 0.258)\left(\frac{W}{h} + 0.8\right)} \qquad \epsilon_{reff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2}\left[1 + 12\frac{h}{W}\right]^{-1/2}$$

$$W = \frac{1}{2f_r\sqrt{\mu_0\epsilon_0}}\sqrt{\frac{2}{\epsilon_r + 1}}$$
