Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VI • EXAMINATION – WINTER 2013**

**Subject Code: 161003** **Date: 02-12-2013**

**Subject Name: Antenna and Wave Propagation**

**Time: 02:30 pm to 05:00 pm** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** Explain the following: **07**
(i) Radiation resistance
(ii) directivity
(iii) First Null Beam width
(iv) Gain

**(b)** Obtain the expressions of electric and magnetic fields of an oscillating dipole. **07**

**Q.2** **(a)** Prove that radiation resistance of a quadrature-wave monopole antenna is 36.5 Ω. **07**

**(b)** "Effective length of an antenna for receiving is equal to its effective length as a transmitting antenna." – Prove. **07**

**OR**

**(b)** (i) An antenna whose radiation resistance is 300 Ω operates at a frequency of 1 GHz and with a current of 3 A.Find the radiated power. **01**
(ii) What is the effective area of a half wave dipole operating at 500 MHz ? **03**
(iii) Find the radiation resistance of a Hertzian dipole of length λ/40 , λ/60 , λ/80 . **03**

**Q.3** **(a)** Obtain the beam width of broadside array and end-fire array. **07**

**(b)** Draw the radiation pattern of 4 element linear array with spacing between elements λ/2 and the currents in phase. **07**

**OR**

**Q.3** **(a)** Derive the expression of transmission loss between transmitting and receiving antenna. **07**

**(b)** Find the basic and actual transmission loss between 2 antennas separated by 30 m operating at 10 MHz when gain of each antenna is 1.65 dB. **07**

**Q.4** **(a)** Obtain the expressions of far fields of circular loop antenna. **07**

**(b)** A circular loop antenna has a diameter of 1.5 λ . Find its directivity and radiation resistance. **07**

**OR**

**Q.4** **(a)** Draw the geometry of a helical antenna and explain its physical parameters. **07**

**(b)** A 16-turn helical beam antenna has a circumference of λ and turn spacing of λ/4. **07**
Find (1) HPBW (2) Axial ratio (3) Power pattern

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|---|---|---|---|
| **Q.5** | **(a)** | Explain the Babinet's principle for slot antenna. | **07** |
| | **(b)** | Write short notes on :<br>(i) Reflector antenna<br>(ii) Lens antenna | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Write short notes on :<br>(i) Log periodic antenna<br>(ii) Phase Measurement methods | **07** |
| | **(b)** | Design a three element Yagi-Uda antenna to operate at a frequency of 172 MHz. | **07** |

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