

**GANPAT UNIVERSITY**  
**B. Tech. Semester VI EC Engineering**  
**Regular/Remedial Examination April-June 2016**  
**2EC601: Antenna Engineering**

TIME: 3 HOURS]

[TOTAL MARKS: 70

**INSTRUCTIONS:**

1. Attempt all questions.
2. Answers to the two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary.

**SECTION-I**

- Q:1** (A) Derive the expression of antenna transmission <sup>LOSS</sup> (FRIIS formula) 4  
 (B) Explain each antenna elements using their definitions. 4  
 (C) What will be the effect of Earth on vertical patterns? Explain. 4

**OR**

- Q:1** (A) Derive the expression of resultant radiation pattern of two-element array. 4  
 (B) Explain different methods of antenna polarization with appropriate figures. 4  
 (C) What is Binomial Arrays? Explain its advantage and disadvantage. 4  
**Q:2** (A) Obtain the pattern of a two-element array fed 180 degree out of phase and spaced at  $d=\lambda/2$ . 4  
 (B) In a microwave communication link, two identical antennas operating at 10 GHz are used with power gain of 40 dB. If the transmitter power is 1 W, find the received power, if the range of the link is 30 km. 4  
 (C) A 2.7 meter diameter parabolic reflector is used in terrestrial low link at 7.375 GHz. Calculate the gain and beam width of the antenna. 4

**OR**

- Q:2** (A) If an array of isotropic radiators is operated at frequency of 6 GHz and is required to produce a broadside beam, find Null-to-Null beam width if the array length is 10m. Also find the directivity. 4  
 (B) The noise figure of an amplifier at room temperature ( $T=290^\circ$ ) is 0.2 dB. Find the equivalent temperature. 4  
 (C) Find the basic and actual transmission losses between two antennas separated by 30 m, operating at 10 MHz, when the gain of each antenna is 1.65 dB. 4  
**Q:3** (A) An antenna has an effective length of 100 meters and current at the base is 450 amperes (rms) at 40000 Hz. What is the power radiated? If the total resistance of the antenna circuit is 1.12 ohms, what is the efficiency of the antenna? 4  
 (B) A thin dipole antenna is  $1/15$  long. If its loss resistance is 1.5 W, find radiation resistance and efficiency. 4  
 (C) If the effective height of an aerial is  $1/150^{\text{th}}$  of the length of the wave emitted, determine its radiation resistance. 3



**SECTION-II**

- Q:4 (A) Define antenna temperature & derive the expression of antenna noise figure. 4
- (B) Define Antenna Impedance? Explain different impedance matching techniques. 4
- (C) State the differences between Broad side & End fire arrays. 4

**OR**

- Q:4 (A) Write a short note on Helical Antenna. 4
- (B) Write a short note on different types of loop antennas, their principal and working. 4
- (C) Explain different methods of excitation of Antennas. 4
- Q:5 (A) How does a Lens antenna work? Derive the equation of the shape of the lens for the lens antenna. 6
- (B) Describe the techniques involved for the measurement of field pattern and power pattern of an antenna. 5

**OR**

- Q:5 (A) Explain the basic construction of a Patch antenna. Mention the advantages and disadvantages of Patch antenna. 6
- (B) What are the different design considerations for the antennas used for satellite communication? Explain the log periodic antenna in brief. 5
- Q:6 (A) Find the complementary slot impedance when the dipole impedance is (i)  $(50 + j20)\Omega$  (ii)  $710\Omega$  4
- (B) Explain the Cassegrain feed technique for a parabolic reflector antenna. 4
- (C) With the help of suitable diagram, explain the phase pattern measurement at short distance. 4

**End of Paper**