Seat No.	

TE (Electronics and Telecommunication) (Revised) (Semester - V) Examination, November - 2017
Antenna and Wave Propagation
Sub. Code : 66314

Day and Date : Thursday, 09 - 11 - 2017 **Total Marks : 100**

Time : 10.00 a.m. to 01.00 p.m.

Instructions : 1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Assume suitable data if necessary.**

SECTION - I

Q1) **Solve any two of the following :** **[16]**

a) Explain Transmission - Line Model of rectangular microstrip antenna. Derive the expressin for fringe factor.

b) Show that the directivity of a broadside array may be expressed as

$$D = \frac{n}{1 + (\lambda/\pi nd)\sum_{k=1}^{n-1}[(n-k)/k]\sin(2\pi kd/\lambda)}$$

c) Show that the average directivity gain over the minor lobes of a highly directive antenna is nearly equal to the stray factor. The directive gain is equal to the directivity multiplied by the normalized power pattern[$= DP_n(\theta,\phi)$], making it a function of angle with the maximum value equal to D.

Q2) Solve any two of the following. **[16]**

a) Explain with suitable example antenna pattern synthesis by pattern multiplication.

b) With the help of suitable figure explain instrumentation for typical antenna-range measuring system.

c) What is the maximum power received at a distance of 0.5 km over a free-space 1 GHz circuit consisting of a transmitting antenna with a 25 dB gain and a receiving antenna with a 20 dB gain? The gain is with respect to a lossless isotropic source. The transmitting antenna input is 150 W.

Q3) Write notes on any three of the following. **[18]**

a) Design procedure of circular microstrip antenna for the dominant TM_{110} mode.

b) Shape - impedance considerations.

c) Antenna ranges

d) Field from oscillating dipole.

SECTION - II

Q4) Solve any two of the following : **[16]**

a) Describe briefly the two different types of phased array radars and compare their relative merits.

b) A sky - wave is incident on D - layer at an angle of 30°. Find the angle of reflection if the frequency of the transmitted wave is 50 MHZ.

c) When the maximum electron density of the ionospheric layer corresponds to refractive index of 0.92 at the frequency of 10 MHz. find the range if the frequency is MUF itself. The height of the ray reflection point on the ionoshperic layer is 400 km. Assume flat earth and negligible effect of earth's magnetic field.

Q5) Solve any two of the following: **[16]**

a) Explain regular and irregular variations of ionosphere.

b) Explain the block diagram of the operation of an MTI radar system using power amplifier in transmitter.

c) Calculate the maximum range of a radar system which operates at 3 cm with a peak pulse power of 500 kW, if its minimum receivable power is 10^{-13} W, the capture area of its antenna is $5m^2$, and the radar cross-sectional area of the target is $20\ m^2$.

Q6) Write notes on any three of the following: **[18]**

a) Explain the following terms related to Ionosphere:

i) Virtual height

ii) Critical frequency

iii) Maximum usable frequency

b) Antenna scanning and tracking techniques.

c) Critical frequency of D, E and F layer.

d) Frequency modulated CW RADAR.

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