Seat No.	

SV - 823

Total No. of Pages : 3

T.E. (E & TC) (Semester - V) Examination, April - 2018

ANTENNA AND WAVE PROPAGATION

Sub. Code : 66314

Day and Date : Tuesday, 24 - 04 - 2018 **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) **Use of non-programmable calculator is allowed.**
4) **Assume suitable data, if necessary.**

SECTION - I

Q1) Attempt any two : **[16]**

a) The radiation intensity of antenna is :

$$U(\theta,\phi)=\begin{cases}\cos^3\theta; & 0°\le\theta\le 90° \\ 0 \quad ; & 90°\le\theta\le 180°\end{cases}$$

with $0°\le\phi\le 360°$

Determine maximum effective aperture of antenna if f= 10GHz.

b) Explain single wire and double wire radiation mechanism of antenna.

c) Derive the equation for normalized electric field due to linear arrays of n - isotropic point sources of equal amplitude and spacing.

Q2) Attempt any two : **[16]**

a) Two space crafts are separated by 3 mm, each has antenna with D = 200 & operating frequency is 2 GHz. If craft A's receiver requires 20dB over 1pw, what transmitter power is required on craft B's receiver to achieve this signal level?

b) Draw & explain with field patterns :

i) Broadside array ii) Ordinary end - fire array

iii) Scanning array

c) What is frequency independent antenna? Explain Rumsey's principle. Draw and explain conical spiral antenna.

P.T.O

Q3) Attempt any two : **[18]**

a) Give experimental set up & measurement procedure of Beamwidth & Directivity measurement of antenna.

b) With neat diagram explain four different feeding methods of microstrip patch antenna.

c) Design a rectangular microstrip antenna using a substrate with dielectric constant of 2.2, h = 0.1588cm, So as to resonate at 10 GHz.

SECTION - II

Q4) Attempt any two :

a) Explain ground wave attenuation factor in detail. **[8]**

b) Explain effective $\in$ and σ of an ionized gas. **[8]**

c) A low power, short range RADAR is solid - state throught, including a low noise RF amplifier which gives it an overall noise figure of 5.77 dB. If antenna diameter is 1m, the IF bandwidth is 500 kHz, the operating frequency is 9 GHz and radar set is supposed to be capable of detecting targets of $5m^2$ cross sectional area at maximum distance of 12 km, what must be peak transmitted pulse power? **[8]**

Q5) Attempt any two :

a) For ionosphere define and obtain equations of, **[8]**

i) Refractive index

ii) Plasma frequency

iii) Critical frequency

iv) Phase and group velocities

b) Draw and explain functional block diagram of pulsed RADAR set. [8]

c) A transmitter operating at F = 1.0 MHz is required to provide ground wave field strength of 1.0 mV/m at a distance of 20 km. A short vertical antenna has as efficiency of 60%. $\sigma = 4 \times 10^5$ ℧/cm, $\in = 15$. Determine transmitter power required. [8]

Q6) Attempt any two :

a) Write a note on RADAR performance factor. [9]

b) Explain Faradays Rotation and measurement of total electron density. [9]

c) A communication system is to be established at a frequency of 60MHz with transmitter power of 1 kW. The field strength of directive antenna is 3 times that of a half - wave antenna Ht = 50m, hr = 5m. A field strength of 80μV/m is required to give satisfactory reception. Find the range of the system. [9]

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