Seat No.	

T.E. (E & TC) (Semester - V) Examination, April - 2019
ANTENNA AND WAVE PROPAGATION
Sub. Code: 66314

Day and Date : Thursday, 25 - 04 - 2019 **Total Marks : 100**

Time : 2.30 p.m. to 5.30 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to 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) With the help of neat figure explain propagation of an electric field lines and its radiations from oscillating dipole.

b) Two spacecrafts are separated by 100 mm. Each has an antenna with D = 1000 operating at 2.5 GHz. If craft A's receiver required 20dB over 1pW, what transmitter power is required on craft B to achieve this signal level.

c) The normalised radiation intensity of antenna is given by

i) $U = \sin\theta \sin\phi$

ii) $U = \sin\theta \sin^2\phi$

iii) $U = \sin\theta \sin^3\phi$

iv) $U = \sin^2\theta \sin\phi$

$(0 \le \theta \le \pi;\ 0 \le \phi \le \pi)$ and zero elsewhere, consider $U = P(\theta, \phi)$

Find Directivity in dB, exact and approximate.

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

a) Derive equation for normalised electric field due to linear array of n-isotropic point sources of equal amplitude and spacing.

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

c) Draw and explain infinite and finite biconical antenna.

P.T.O.

Q3) Attempt any two of following. **[18]**

a) What is antenna impedance? Give experimental set up of antenna impedance measurement using.

i) Wheatstone's Bridge method.

ii) Slotted line method.

b) With neat diagram, explain construction characteristics, application and limitations of microstrip patch antenna.

c) Design a rectangular microstrip antenna to resonate at 9 GHz using a substrate with dielectric constant of 2.56 and height of 0.125 cm.

SECTION - II

Q4) Attempt any two. **[16]**

a) Differentiate between three different wave propagation mechanisms.

b) Explain in detail wave tilt of ground waves.

c) MTI RADAR operates at 5 GH_2 with PRF of 800 PPS, calculate lowest three blind speed of RADAR.

Q5) Attempt any two. **[16]**

a) A transmitter is operating at a frequency of 1.7 MH_2 is required to provide a ground wave field strength of 0.5 mV/m at a distance of 10 KM. A short vertical transmitting antenna has an efficiency of 50%. The conductivity of ground is 5×10^{-5} (mho/cm) and its relative permittivity is 10. Find transmitted power required.

b) With the help of geometry of direct and ground reflected waves, obtain the equation for reflection factor for horizontal and vertical polarization.

c) Explain following terms:

i) Vertual height.

ii) Critical frequency.

iii) MUF.

Q6) Attempt any two. **[18]**

a) With the help of block diagram explain operation of FM-CW RADAR.

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

c) Explain faraday's Rotation and measurement of total electron density.

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