(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3089 Roll No. | | | | | | | | | | |

B.Tech.

FIFTH SEMESTER EXAMINATION, 2006-07

ANTENNA AND WAVE PROPAGATION

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt **ALL** questions.*

(ii) All questions carry equal marks.

(iii) In case of numerical problems assume data wherever not provided.

(iv) Be precise in your answer.

1. Attempt ***any two*** parts of the following : **(10x2=20)**

(a) State and prove reciprocity theorem for antenna. Show that the transmitting and receiving radiation pattern of antennas are the same.

(b) Define the effective area of the antenna. Derive an expression for effective area of the antenna in terms its gain 'g'.

(c) What do you mean by the radiation resistance of an antenna ? What is the nature of the current distribution in a base fed half wave vertical antenna erected just above a perfect earth ?

2. Attempt *any two* parts of the following : **(10x2=20)**

(a) Define broad side and end fire arrays. What are elements that radiate in end fire and broad side modes ?

(b) A transmitting antenna at a height of h_2 above a smooth perfectly conducting flat-earth surface sends a signal to a receiving antenna of height $h_1 (h_2 > h_1)$ with ground range between them equal to 'a'. Obtain the path difference between the direct and reflected signals reaching the receiving antenna.

(c) Explain the principle of pattern multiplication and find the array factor of a two element array.

3. Attempt *any two* parts of the following : **(10x2=20)**

(a) What is the condition of total deflection of radio waves from the Ionosphere ? Obtain relationship between the skip distance and maximum usable frequency over a flat earth surface.

(b) What is a space wave antenna ? Find the tilt angle for a vertically polarized 3GHz wave travelling along a flat copper sheet.

(c) Write note on tropospheric wave.

4. Attempt *any four* parts of the following : **(5x4=20)**

(a) How a loop antenna is utilized for calculating the field strength and to determine the direction of an incoming radio signal. Deduce the formula used.

(b) Why rhombic antenna is used ? Draw its neat diagram and explain its special features. What happens to the main lobe of rhombic antenna if its frequency is doubled ?

(c) An Yagi-Uda antenna is to be erected on the roof of a house with directors and reflector to receive TV signals operating in the range of frequency 61MHz to 61MHz. Determine all dimensions of the Antenna for a velocity factor of 0.9. What is the effect of many directors ?

(d) A parabolic reflector antenna is designed for operation at 3GHz. Its largest aperture dimension is 20ft. For measurement of radiation pattern, what should be minimum distance between primary and secondary antenna ?

(e) How loop antenna is used for direction finding ?

(f) Describe constructional details and principle of operation of broadband antenna.

5. Attempt *any four* parts of the following : **(5x4=20)**

(a) Explain the procedure for measurement of radiation pattern with the help of heat sketch.

(b) How the gain of antenna is measured by direct comparison method ?

(c) Explain and deduce the expression for noise figure and noise temperatures of an antenna.

(d) What is the antenna efficiency ? Explain it with examples.

(e) How radiation pattern can be measured ?

(f) Explain the process of measurement of the efficiency of the antenna.

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