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BIEL-013

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

00383

Term-End Examination

December, 2016

BIEL-013 : ANTENNAS AND PROPAGATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted. Missing data, if any, may be suitably assumed.*

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1. (a) Differentiate between directive gain and directivity of an antenna. Establish the relation $g_d = \frac{120\pi^2}{R_{rad}} \left(\frac{l_{eff}}{\lambda} \right)^2$, where the symbols have their usual meaning. *5*

(b) Prove that the radiation field of a half-wave radiator is zero in the direction of its axis. Sketch its radiation diagram. *5*

2. Discuss the condition under which an array of antenna will behave either as a broadside array or an end-fire array. Derive the necessary expression. *10*

3. Assuming the earth to be a perfect conductor, deduce an expression for the electric field intensity of the radiation field at a point r metres away from a short vertical antenna. Show that the power radiated by it is

$$P = 1578 \left(\frac{h}{\lambda}\right)^2 I_{rms}^2 \text{ watts.}$$ *5+5=10*

4. Describe how a loop antenna can be used for direction finding of an incoming EM wave. Derive an expression for the induced voltage in the loop. *5+5=10*

5. Discuss the theory of operation of a log periodic antenna. Show that it is a frequency independent antenna. *10*

6. Explain the parabolic reflector type antenna with Cassegrain feed. Also mention its advantages and disadvantages. *10*

7. (a) Describe the slotted line technique for impedance measurement. *5*

   (b) Describe the 3-element method for gain measurement. *5*

8. Explain why the ratio of lower frequency limit to maximum usable frequency for establishing radio communication in the SW band is generally smaller at night than in the day time. *10*

9. Bring out the important differences between ground-wave, space-wave and ionospheric propagation of radio waves, indicating their application areas. *10*

10. Write short notes on any ***two*** of the following : *2×5=10*

    (a) Babinet's Principle and Complementary Antennas

    (b) Microstrip Patch Antennas

    (c) Electrical Properties of Ionosphere
