KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

JUL 12. 2017

Level : B. E.
Year : IV
Time : 2 hrs. 30 mins.

Course : ETEG 402
Semester : I
F. M. : 55

SECTION "B"
[5 Q. × 11=55 marks]

Attempt ANY FIVE questions.

1. a. Derive the expression for the electric field of two isotropic point sources of the same amplitude and in-phase quadrature. Draw the radiation pattern for $\lambda/2$ spacing between them. [7]
   b. The pyramidal horn is fed by a rectangular waveguide with path length difference of 0.2 λ in the E-plane and 0.375 λ in the H plane for which the E-plane aperture is 10 λ. Determine [4]
   i) horn length
   ii) H-plane aperture
   iii) flare angle in E and H planes
   iv) directivity

2. a. Derive the expression for the far field pattern of a continuous broadside array of length 'a' having uniform amplitude and phase. [7]
   b. In a microwave communication system operating at frequency of 10 GHz if there is obstruction within the Fresnel zone below the line of sight from Tx and Rx then calculate the height from obstruction to line of sight if distance between Tx to obstruction is 10 m and Rx to obstruction is 11 m. [4]

3. a. Explain spiral antenna and prove that $\theta = \tan\beta \times \ln r$. [5]
   b. Calculate the total phase difference of the fields from 5 adjacent sources at a large distance for end-fire array with increased directivity if the angle between array axis and distant point is 45 °, wavelength of the radiated signal is λ and spacing between the sources is $\lambda/2$. [3]
   c. Differentiate skip distance and skip zone with figure. [3]

4. a. Explain non-metallic dielectric lens antenna using Fermat's principle and derive the equation that gives the required shape of the lens. [6]
   b. Design a log-periodic dipole array with five elements with expansion factor k=1.25 and explain which part of LPDA will radiate maximum and minimum at operating frequency of 300 MHz and why? [5]

5. a. Point out the differences between ground wave and skywave propagation. [6]
   b. Explain the different types of parabolic reflector feed systems in brief. [5]

6. a. Explain the condition of maximum power transfer in the antenna system and obtain the expression for power radiated and dissipated by the antenna in transmitting mode. [6]
   b. Write short notes on: [2.5 ×2=5]
   i) Rhombic antenna
   ii) Huygen's principle