Registration no:

2nd Semester Back Examination 2016-17
MICROWAVE AND ANTENNA ENGINEERING
BRANCH:COMMUNICATION ENGG, COMMUNICATION SYSTEMS, ELECTRONIC & COMM. ENGG,
ELECTRONIC AND TELECOMMUNICATION ENGG
Time: 3 Hours
Max Marks: 70
Q.CODE: Z496
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** (2 x 10)
  a) What are the different types of feed associated with Microstrip antenna?
  b) When does a n-type GaAs bulk exhibit amplification rather than spontaneous oscillation?
  c) Name a multiport microwave junction which is not reciprocal. Write the S matrix of such a perfectly matched and loss less three port junction.
  d) What are the different types of Smith Chart?
  e) For a quarter wave length ideal transmission line of characteristics impedance 50Ω and load impedance 100Ω. Find out the input impedance?
  f) Write the disadvantages of microstrip antenna.
  g) What is the directivity of a pencil beam antenna with half power beam widths of 2^0 and 3^0 respectively in the two principal planes?
  h) What are the different modes of operation of Gunn diode?
  i) Why double stub matching is required?
  j) Define radiation resistance and efficiency of an antenna?

Q2 a) Discuss about the different properties of a scattering matrix. **(4)**
  b) Design a single section , Quarter wave matching transforms to match a 10Ω load to a $50\ \Omega$ line at f_0 =3GHz . Determine the percentage band width of which SWR $\leq$ 1.5 **(6)**

Q3 a) Name a device that can be termed as a four port networks. Write down S-parameters and three quantities to characterize its properties. With neat diagrams show its power flow conventions. **(5)**

b) A typical GaAs Gunn diode has the following parameters. **(5)**
Electron density $n = 1018 \, Cm^{-3}$
Electron density at lower valley $n_l = 10^{10} Cm^{-3}$
Electron density at upper valley $n_u = 10^8 Cm^{-3}$
Temperature $T = 300^0 K$, Determine the conductivity of the diode.

Q4 a) Show the geometry of a log periodic array and find the relation between **(5)** three parameters that defines the array. Explain how the lowest and highest operating frequency is related to the number of elements?

b) Define Array Factor and Element Pattern of an N-element uniform linear **(5)** array of infinitesimal dipoles. Find the position of the Principal maxima, Secondary maxima and the Nulls from the expression of the Array Factor.

Q5 a) Explain LSA mode of operation of Gunn diode. **(5)**
b) Find the directivity of linear broad side uniform array of 10 isotropic elements **(5)** with a separation of λ/4 between the elements

Q6 a) Derive the expressions for the far-fields of a Hertzian dipole $\mathbf{I_0} \, dl$ placed **(5)** at the origin of a spherical coordinate system.
b) Calculate the power gain of an optimum horn antenna approximately with the **(5)** square aperture of 10λ of a side.

Q7 Write briefly the basic characteristics of microstrip antenna. How it is **(10)** better than a stripline? Discuss various techniques of feed to microstrip antenna.

Q8 **Write short answer on any TWO:** **(5 x 2)**
a) IMPATT Diodes
b) Aperture antennas
c) Fabrication of MMIC
d) Noise Temperature of cascaded networks