Code No. : 5150

FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I Sem. (Main) Examination, December 2011
MICROWAVE ENGINEERING

Time: 3 Hours] [Max. Marks: 75

Note : *Answer **all** questions from Part **A**, Answer **any five** questions from Part **B**.*

PART – A **(25 Marks)**

1. Draw a neat sketch of electric and magnetic fields between parallel plane for TE_{10} wave. **2**
2. Define cut of frequency. Derive cut off frequency for parallel plane waveguide. **3**
3. Why TEM wave is not possible in hallow waveguide ? **3**
4. Compare the properties of striplines and microstriplines. **3**
5. A lossless microwave two part circuit has $S_{11} = 0.2\, e^{j0.5}$ and $S_{22} = 0.2\, e^{j0.6}$. Determine S_{12}. **3**
6. Describe the vane type attenuator with neat diagram. **3**
7. Define the parameters of a directional coupler. **2**
8. Why helix is used as slow wave structure in travelling wave tube ? **2**
9. How π-mode in magnetron separated from other modes ? **2**
10. How the domain is formed in Gunn diode ? **2**

PART – B **(50 Marks)**

11. a) Derive field equations for TE waves in a parallel plane wave guide. **6**
    b) Derive attenuation factor 'α' for TEM wave. **4**
12. An air filled rectangular waveguide has dimensions of a = 6 cm, b = 4 cm. The signal frequency is 3GHz. Compute the following for TE_{10}, TE_{11} modes.
    i) Cut off frequency
    ii) Wavelength in the waveguide
    iii) Phase constant and velocity in the waveguide
    iv) Group velocity and wave impedance in the guide. **10**

13. a) Explain the scattering matrix formulation for N-port junction. 5

    b) Show that for a reciprocal junction $S_{ij} = S_{ji}$. 5

14. Derive the scattering matrix to directional coupler and explain its applications. 10

15. a) Construct a four port circulater using two magic tees and one gyrator. 5

    b) Explain the limitations of conventional tubes at UHF range. 5

16. a) Show that maximum electronic efficiency of a two cauity klystron amplifier is about 58%. 5

    b) Derive the expression for velocity modulation equation for two cauity klystron amplifier. 5

17. Explain the basic principle of operation of a Gunn diode and mention its applications. 10