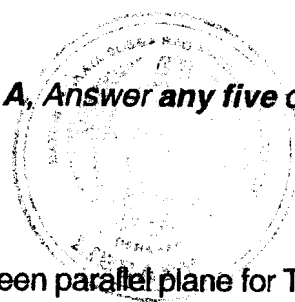


FACULTY OF ENGINEERING
B.E. 4/4 (ECE) I Sem. (Main) Examination, December 2011
MICROWAVE ENGINEERING

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 off frequency. Derive cut off frequency for parallel plane waveguide. 3
3. Why TEM wave is not possible in hollow 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 circulator 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 cavity klystron amplifier is about 58%. 5
- b) Derive the expression for velocity modulation equation for two cavity klystron amplifier. 5
17. Explain the basic principle of operation of a Gunn diode and mention its applications. 10