



Reg. No. :

Name :

**Seventh Semester B.Tech. Degree Examination, November 2013
(2008 Scheme)
08.703 : MICROWAVE ENGINEERING (T)**

Time : 3 Hours

Max. Marks : 100

PART – A



Answer **all** questions.

1. Describe phase, velocity and group velocity. Mention the relation between them.
2. Write an expression for maximum power that can be handled by a rectangular wave guide. Explain the various terms. What is the dominant mode in the rectangular waveguide ?
3. Compare klystron and TWT amplifiers.
4. A TWT has a beam voltage of 3 kV and beam current 30 mA. The helix has a characteristics impedance 10Ω and the circuit length is 30. Find the gain parameter and o/p power gain.
5. List the conditions the semi conductor structure should satisfy in order to exhibit negative resistance.
6. Write an expression for the drain current in the Schottky barrier gate FET and explain the terms.
7. Describe the principle of operation of tunnel diode.
8. List the properties of directional couples. Explain them.
9. With a simple laboratory setup, explain how microwave power is measured.
10. Describe the applications of microwave circulators and isolators. **(4×10=40 Marks)**



PART – B

Answer **any two** questions from **each** Module.

Module – I

11. a) Explain bunching in a two cavity klystron with the help of apple gate diagram.
b) Derive an expression for the bunching parameter. 10
12. a) Describe the properties of slow wave structures.
b) With a neat diagram explain the amplification process in the TWT amplifier. 10
13. A two cavity klystron amplifier has the following parameters.
 $V_0 = 1200$ V, $I_0 = 28$ mA, $f = 8$ GHz. Gap spacing in either cavity $d = 1$ mm spacing between two cavities $L = 4$ cm, Effective shunt resistance $R_{sh} = 40$ k Ω , excluding beam loading. 10
- a) Find the i/p gap voltage to give maximum o/p voltage.
b) Determine the voltage gain neglecting beam loading in the o/p cavity.
c) Calculate the efficiency of amplifier neglecting beam loading.
d) Calculate the beam loading conductance.

Module – II

14. Derive the Hull cut off voltage equal for a cylindrical magnetron. 10
15. a) Define negative differential resistivity.
b) Explain J-E characteristics of Gunn diode.



c) An n-type Ga As Gunn diode has the following parameters.

Threshold field $E_{th} = 2800$ V/cm

Applied field $E = 3200$ V/cm

Device length $L = 10$ μ m

Doping concentration $n_0 = 2 \times 10^{14}$ /cm³

Operating frequency $f = 10$ GHz



Calculate :

- a) Electron drift velocity
- b) Current density
- c) Negative electron mobility.

10

16. a) Describe the working of a common source amplifier using MESFET.

b) How a tunnel diode can be used as a circulator.

10

Module – III

17. a) Explain the properties of s-matrix .

b) Derive the scattering matrix of a magic tee.

10

18. a) Explain the construction and working of microwave isolator.

b) Explain Faraday rotators in ferrites.

10

19. Explain the basic digital microwave communication system. Mention some of its applications.

10