B. Tech Third Year : 5th Semester

MICROWAVE ENGINEERING-I, DEC., 2012

(FOR 5 EC 5 BRANCH OF ENGINEERING)

Times : 3 Hours | **Min. Passing Marks : 24** | **Total Marks : 80**

Instructions to Candidates: *Attempt overall **Five Questions** selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

UNIT-I

1. (a) Find relation of the Following for rectangular waveguide for T.E. mode

(i) Cutoff Frequency

(ii) Wavelength in the waveguide

(iii) Phase constant and phase velocity in the waveguide

(iv) Group Velocity and wave impedance in the waveguide **[12]**

(b) Write microwave frequency band? **[4]**

OR

(a) Find relations of power transmission and power loss in rectangular waveguide? **[8]**

(b) A TE_{11} wave is propagation through a circular waveguide. The diameter of the guide is 10 cm and waveguide is airfilled.

(i) Find the cutoff frequency

(ii) Find the wavelength (λg) in the guide for a frequency of 3GHz

(iii) Determine the wave impedance in the guide **[8]**

UNIT-II

2. Write short note on (any four)

(i) Magic Tee

(ii) Rat race Junction

(iii) Isolator

(iv) Circulators

(v) Directional Coupler **[4×4=16]**

OR

Explain the different between E-plane tee and H-plane tee and Find S-matrix For E-plane and H-plane. Describe the use of magic Tee as an isolator. **[16]**

UNIT-III

3. Describe the phenomenon of velocity modulation in two cavity klystron? Describe the construction of two cavity klystron amplifier. Explain the bunching process. How does a reflex klystron differ from a two cavity klystron? **[16]**

OR

What are limitation of conventional tubes at high frequencies? **[16]**

UNIT-IV

4. (a) What is the use of slow wave structures in TWTs? **[4]**

(b) Describe the advantages of TWT over klystron? **[4]**

(c) Explain with a neat diagram how TWT is used as microwave amplifier? **[8]**

OR

Explain the working of coupled cavity TWT with suitable diagram. Show that the output power gain of TWT is

$Ap = -9.54 + 47.3\ NC$ db **[6+10=16]**

UNIT-V

5. (a) What are the cross field devices? How does a magnetron sustain its oscillation using this cross field? Assume π mode for explaining the same.

(b) Explain voltage tunable magnetron.

OR

A circular BWO operates under the following parameters

Operating frequency	$F = 8GHz$
Anode Voltage	$V_0 = 25$ KV
Anode Current	$I_0 = 4A$
Magnetic Flux density	$B_0 = 0.35\ Wb/m^2$
Characteristic Impedance	$Z_0 = 50$ ohm
D - Factor	$D = 0.75$
b - Factor	$b = 0.50$

Compute the following:

(i) DC electron velocity

(ii) Electron beam phase constant

(iii) Delta differentials

(iv) Propagation Constant

(v) Oscillation Condition **[16]**