

III B.Tech II Semester Supplementary Examinations, April/May 2005
MICROWAVE ENGINEERING
(Electronics & Communication Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Show that the theoretical efficiency of reflex klystron is 22.78%.
(b) How is tuning achieved in reflex klystron oscillators? Mention the tuning range of such a device.
2. (a) Describe completely the effect of a dc axial field on the electrons traveling from the cathode to the anode of magnetron and describe the combined effect of the axial magnetic field and radial dc electric field.
(b) A normal circular magnetron has the following parameters:
Inner radius $R_a = 0.15m$, outer radius $R_b = 0.45m$, Magnetic flux density $B_0 = 1.2mWb/m^2$
 - i. Determine the Hull cut off voltage
 - ii. Determine the cut off magnetic flux density if the beam voltage V_o as 6000V.
 - iii. Determine the cyclotron frequency in GHz.
3. (a) Give the classification of solid state MW devices along with examples?
(b) Why conventional tubes and solid state devices can not be used at microwave frequencies ?
4. (a) Give Manley–Rowe relation equations regarding power flow of a nonlinear reactance.
(b) Describe the amplification mechanism of a parametric amplifier with the help of its equivalent circuit.
5. Describe the principles of operation and constructional details for the following type of attenuators:
 - (a) Coaxial attenuator
 - (b) Slab and Flap attenuators
6. Describe with a neat sketch, the working of a 4-port directional coupler, and obtain S-matrix when the coupling factor is 3dB. List out the different types of directional couplers.
7. (a) Derive the relationship between guide wavelength, cut-off wavelength and free space wavelength.
(b) Give the experimental procedure to verify the above relationship.

8. (a) Explain the concepts of propagation delay time for a stripline.
- (b) Is the Effective dielectric constant of a micro stripline a function of Relative dielectric constant? Justify.

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