N	R	3	1	1	7	0	1	N	R

2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
MICROWAVE ENGINEERING
(ELECTRONICS TELEMATICS)

NOVEMBER 2005

TIME – 3 HOUR
MARK – 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) What is electronic tuning in case of Reflex Klystrons?

(b) A two-cavity klystron amplifier has the following parameters:
Beam Voltage : VO = 30 KV

Beam Current : IO = 3 A

Operating Frequency : f = 10 GHz

Beam coupling coefficient : i = 0 = 1

Dc electron charge density : ⁄ 0 = 10-7c/m3

Signal voltage : V1 = 15 V

Cavity shunt resistance : Rsh = 1 K

.Total shunt resistance including load : Rsht = 10 K
Calculate :

i. The plasma frequency

ii. The reduced plasma frequency for R = 0.4

iii. The induced voltage in the output cavity

iv. The electronic efficiency [6+10]

2. (a) Explain how magnetron allows electron bunching to take place and prevents favored electrons from slipping away from their relative position.

(b) Is strapping advantageous under all conditions?

(c) Draw the cross section of a magnetron cavity system that does not require strapping. [6+6+4]

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? [8+8]

4. Describe a typical helium cooled ruby maser construction, operation, performance characteristics and applications. [16]

5. (a) Explain the principle of working of a precision rotary phase shifter, with neat sketches.

(b) Write down the S-matrices for

i. a simple ideal rectangular waveguide section, and

ii. a simple ideal dielectric phase shifter in a rectangular guide. *[6+10]*

6. (a) Show that a lossless reciprocal three-port network can be physically realized if two of its ports are matched. Write down S-matrix for such a component.

(b) A 3 port circulator has an insertion loss of 1 dB, Isolation of 30 dB, and a VSWR of 1.50. Find its S-matrix. *[8+8]*

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+8]*

8. (a) Which are the factors that limit the Quality factor of micro stripline?

(b) With respect to the Dielectric attenuation constant, derive an expression for Quality factor. *[6+10]*