

JK Lakshmipat University, Jaipur
Institute of Engineering and Technology
End Term Examination

B.Tech. [3rd Year]/ [5th Semester]/ [2013-14]

Student ID



Course Name: Microwave Engineering -1

Course Code: ECE 504

Max Marks: 40

Time: 03.00 hr

Instructions:

1. Attempt all sections.
2. Students should have their smith chart (Sharing is not allowed)
3. Memory less calculators are allowed
4. Submit smith chart along with answer sheet

Section A

Q.1.

- (a) Whenever two or more modes have the same cutoff frequency, they are said to be ----- (1)
- (b) Efficiency of FET is higher than that of a BJT. (True / False) (1)
- (c) Write down the relation (formulae) between standing wave ratio and reflection coefficient. (1)
- (d) What is the full form of MASER? (1)
- (e) Microwave signals travel by line of sight and can be bent by the ionosphere. (True/ False) (1)

Q.2.

- (a) Draw a proper **schematic** diagram of reflex klystron. Explain its working. (3)
- (b) Name the different modes of operation for BJT and explain briefly. (2)

Section B

(20)

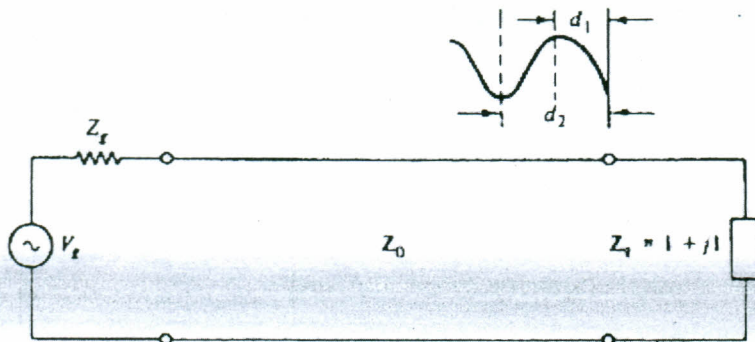
Attempt **4 questions out of 5** questions in this sections.

All questions carry **equal marks**.

Q.3. Explain the six fabrication techniques of monolithic microwave integrated circuits.

Q.4. Given the normalized load impedance $z_L = 1 + j1$ and the operating wavelength $\lambda = 5\text{cm}$, determine the first $V_{\max}$, first $V_{\min}$ from the load, and the voltage standing wave ratio ρ as shown in

given figure (Without smith chart zero mark will be given). Student ID



Q.5. A two cavity klystron amplifier has the following parameters:

$$V_0 = 1000 \text{ V}, \quad R_0 = 40 \text{ k}\Omega, \quad I_0 = 25 \text{ mA}, \quad f = 3 \text{ GHz, and}$$

Gap spacing in either cavity (d) = 1 mm, Spacing between the two cavities (L) = 4 cm, and

Effective shunt impedance, excluding beam loading (R_{sh}) = 30 k Ω .

Find the following:

- Input gap voltage to give maximum voltage V_2 .
- Voltage gain, neglecting the beam voltage in output cavity
- Efficiency of the amplifier, neglecting beam loading
- Calculate the beam loading conductance

Q.6.

(a) Find out the separation equation for both TE and TM modes in rectangular cavity resonator and also find out the resonant frequency for a lossless dielectric.

(b) Derive the formula for Q-factor of a cavity resonator.

Q.7.

(a) Explain about the cavity resonator.

(b) Write down the difference between the TWT and the klystron.

(c) What is impedance matching? Explain with proper diagram.

Section C

Q.8.

(a) Define waveguides. Derive the wave equation for **rectangular** waveguide. (5)

(b) Derive the field equations in rectangular waveguides for **TE mode and TM mode**. (5)

OR

Q.8.

(a) Define waveguides. Derive the wave equation for **circular** waveguide. (5)

(b) Derive the field equations in circular waveguides for **TE mode and TM mode**. (5)