V-Ex-I-F-11

B.E. Sem VII (Rev) - EXTC - May - 2006

Microwave Devices and Circuits

K.T Exam

Con. 2946-06.. TV-9177

(REVISED COURSE)

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt in all **five** questions, including Question No.**1.**
(3) Assume **suitable data if necessary.**

1. Attempt any **two** of the following :— 20
   (a) Compare the linear phase shifter and dielectric phase shifter.
   (b) Compare the Gyrator circulator and directional coupler circulator.
   (c) Compare the microstrip with striplines.

2. (a) Explain the π-mode operation of magnetron oscillator. 8
   (b) Derive the relation between the power output and repeller voltage for reflex Klystron. 8
   (c) How does TWT differs from Klystron amplifier ? 4

3. (a) Explain how a parametric amplifier can operate as up-converter and down-converter. 8
   (b) Derive Manley-Rowe relations for parametric amplifiers. 6
   (c) Describe the dielectric measurement with the help test bench. 6

4. (a) Explain Gun effect using the two Valley theory. 8
   (b) Determine input power, output power and efficiency for reflex Klystron with data given below— 8
   Peak mode, n = 2
   Beam voltage, V_0 = 300 volts.
   Beam current, I_0 = 20 mA
   Signal voltage, V_1 = 30 volts.
   (c) State the limitations of conventional tubes of microwave frequency. 4

5. (a) Describe in brief the operation of TRAPATT diode. 8
   (b) For helix TWT, Determine the gain, if — 8
   Helix impedance = 20 Ω
   Interaction length = 22 cm
   Beam voltage = 5 kV
   Beam current = 500 mA
   Operating frequency = 36 H_2.
   (c) Differentiate between the electron divices and transit time devices. 4

6. (a) The S-matrix parameter of a certain Silicon MESFET are as follows— 8

$$\begin{bmatrix} 0{\cdot}5\angle -110 & 0{\cdot}5\angle -180 \\ 5{\cdot}5\angle +180 & 0{\cdot}4\angle -15 \end{bmatrix}$$

   Determine , (i) G_{max}
   (ii) Unilateral Power gain if—
   $\tau_s = 0{\cdot}1$, $\tau_l = 0{\cdot}11$
   (iii) Maximum unilateral gain
   (iv) Intrinsic noise figure if—
   $\gamma = 2{\cdot}3$, E = 1500 V/m.
   (b) Explain how a magic Tee can be used as mixer.
   (c) Derive the relation for the input impedance of a $\lambda/8$ line when terminated in a complex load Z_L with $Z_0 = |Z_L|$.

7. Write short note on the following :—
   (a) Smith Chart and its application
   (b) Microwave application
   (c) Transmission line equation
   (d) Dominant mode in circulator wave guide.