



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data wherever necessary.
 10. Illustrate your answers wherever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) What is velocity modulation ? How is it different from normal modulation ? Explain how velocity modulation is utilized in klystron amplifier. **7**
- b) A reflex klystron operates at 8GHz at the peak of $n=2$ mode with $V_0=300V$, $R_{sh} = 20k\Omega$ and $L = 1mm$. If the gap transit time and beam loading are neglected, find the
- i) Repeller voltage.
 - ii) Beam current necessary to obtain an RF gap voltage of 200V.

OR

2. a) Explain the operation of a reflex Klystron using an Applegate diagram. Show that the theoretical efficiency of reflex klystron is 22.78% **7**
- b) What are slow wave structures ? Explain how a helical slow wave structure used in TWT achieves amplification. **7**
3. a) Derive an expression for the cut-off magnetic flux density with reference to a cylindrical cavity magnetron. **8**
- b) What is strapping in magnetron ? How is the same effect obtained without strapping. **5**

OR

4. a) Explain the terms frequency pulling and frequency pushing with reference to a magnetron. **5**
- b) A normal circular magnetron has the following parameters. Inner Radius $R_a=0.15m$, outer radius $R_0=0.45m$, 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_0 as 6000V.
 - iii) Determine the cyclotron frequency in GHz.

5. a) Define the following term and their physical significance with reference to a transmission line. 7
 i) Characteristics impedance ii) Phase velocity
 iii) Phase constant iv) Stub matching
 v) VSWR
- b) A 600Ω lossless transmission line is fed by a 50Ω generator. If the line is 200m long and terminated by load of 500Ω , determine in dBs. 6
 i) Reflection loss. ii) Transmission line loss and
 iii) Return loss.

OR

6. a) Explain the different types of MIC's in details. 6
 b) Explain the different steps in fabrication process of MMICs. 7
7. a) Draw and explain the Magic Tee. Derive the scattering matrix for Magic Tee. 7
 b) Draw and explain the Directional Coupler along with its scattering matrix. 7

OR

8. a) What is Faraday Rotation in ferrites ? Explain the operation of Isolator in details. 7
 b) Write a note on ferrite phase shifters. 7
9. a) Explain the method of low power measurement. 6
 b) Explain the different method of microwave frequency measurement. 7

OR

10. a) Write a note of Network Analyzer and its use in measurement. 6
 b) Explain one method for measurement of medium microwave power. 7
11. a) Draw and explain the PIN diode along with its properties and applications. 7
 b) Explain the parametric amplifier with diagram. 6

OR

12. Write short notes on **any three**. 13
 i) Gunn diode. ii) IMPATT Diode.
 iii) MASER'S. iv) Varactor diode.
 v) Microwave detector diode.
