B.E. Sixth Semester (Electronics Engineering) (C.B.S.)

Microwave Engineering

P. Pages : 2 **KNT/KW/16/7379**

Time : Three Hours * 0 0 9 3 * Max. Marks : 80

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 whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain the bunching process in two cavity klystron. **4**

b) Explain how transit time limits the operation at high frequencies. **3**

c) A two cavity klystron amplifier has the following parameters. **6**

Beam voltage	= 900v
Beam current	= 30mA
Frequency	= 9 GHz
Gap spacing in either cavity	= 1mm
Spacing between center of cavities	= 4cm
Effective shunt impedance	= 40kΩ

Calculate:
i) Electron Velocity
ii) The DC electron transit time
iii) Input voltage for maximum output voltage

OR

2. a) With the help of applegate diagram explain the velocity modulation and bunching process in reflex klystron. **7**

b) A reflex klystron operates at the peak of n=2 mode, the dc power input is 40mW and V_1/V_0 =0.278. If 20% of power delivered by the beam is dissipated in cavity walls, find the power delivered to the load. **6**

3. a) Draw a neat sketch of TWT and explain its working. **8**

b) An O-type TWT operates at 8 GHz. The slow wave structure has a pitch angle of 4·4° and an attenuation constant of 2 Np/m. Determine the propagation constant ४ of the travelling wave in the tube. **5**

OR

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4. a) Derive the mathematical analysis of magnetron and show that path of electron is parabolic. **8**

b) Explain the "Phase Focusing Effect" in magnetron. **5**

5. a) Derive the expression for Input Impedance of a transmission line. **7**

b) An impedance of $(50 + j50)\Omega$ is used as a load on a transmission line of characteristics impedance 50Ω using Smith chart, **7**

Find:

i) Reflection co-efficient in magnitude and phase.

ii) VSWR

iii) The distance of first voltage maxima from the load

OR

6. a) What are Hybrid MIC ? In which frequency range it is used. **4**

b) What do you understand by thick and thin film technologies ? **4**

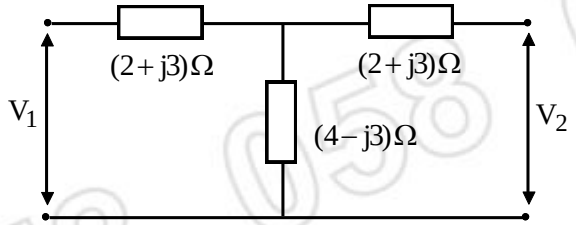
c) Explain the process involved in fabrication of MMICs. **6**

7. a) State and prove the zero property and unity property of S-Matrix. **6**

b) Derive the scattering matrix of Magic tee. **7**

OR

8. a) Find the scattering parameters for the given Network. **7**



b) Explain the operation of Rat-Race circuits. **6**

9. a) Explain the calorimeter - wattmeter's method of microwave power measurement. **7**

b) Calculate the SWR of transmission system operating at 10 GHz. Assume TE_{10} wave transmission inside a waveguide of dimensions a = 4 cm, b = 2.5 cm. The distance measured between twice minimum power points = 1 mm on a slotted line. **6**

OR

10. a) Describe various techniques of measuring unknown frequency. **6**

b) Explain precision variable attenuator with the help of power flow diagram. **7**

11. a) State Manley-Rowe relations as applied to parametric amplifiers. What are the conditions for parametric up converter and down converter ? **7**

b) Write short note on PIN diode. **7**

OR

12. a) Define Gunn effect with the help of two valley model theory. Explain how Gunn diode exhibits negative resistance. **7**

b) Write the short note on MASER's. **7**

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