2019

MSc

4th Semester Examination

ELECTRONICS

PAPER – ELC-401(Theory)

Full Marks : 50

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer question no- 1 & any *Three* from the rest.

1. a) What is the backward wave tube? 2X5

b) What is microwave isolator?

c) Show that a transmission line may be used as resonaton circuit?

d) Why conventional tubes like triodes, tetrodes, pentodes cannot produce signal above I GHz?

e) Show the equivalent circuit of Tunnel diode & find its input impedance.

2. a) Deduce an expression for the resonant frequency of a rectangular resonator. what is its dominant mode ?

b) A square Based cavity (a=c) of rectangular cross section is constructed by copper ($\sigma = 5.7 \times 10^7$ S/m) waveguide that has inner dimensions a= 3 cm and b= 1.5 cm. For dominant mode (TE_{101}), determine resonant frequency & Q of the cavity . Assume free space medium inside the cavity. 7+3

3. a) Construct a three port network that is non reciprocal but loss less & matched at all ports . Find its S-matrix.

b) Consider a loss less two port net work

i) if the network is reciprocal, show that $|S_{21}|^2 = 1 - |S_{11}|^2$.

ii) If the network is non reciprocal, show that it is impossible to have unidirectional transmission where $S_{12} = 0$. 6+4

4. a) What is Gunn-effect ?

b) Show that for transfer electron devices

i) Mobility of electron is higher in the lower valley than upper valley.

ii) Effective electron mass is higher in the upper valley.

c) Draw the equivalent circuit of IMPATT diode. 2+6+2

5. a) Construct a lossy three port power divider which is matched at all ports. Find its Scattering matrix and its power division.

   b) A loss less T – junction power divider has source impedance of 50 Ω . Find the output characteristic impedance so that input power is divided in to 2:1 ratio. Compute the reflection co-efficient seen into the output ports. 6+4

6. a) Draw the I-V characteristic of PNPN device and show its different region.

   b) Briefly mention different methods for triggering the SCR .

   c) What is intrinsic stand off ratio of UJT?. 4+4+2