2018

M.Sc.

4th Semester Examination

ELECTRONICS

PAPER—ELC-401

Subject Code—27

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.

(Microwave and Power Electronics)

Answer Q. No. *1* and any *three* from the rest.

1. Answer any *five* questions.

(a) Why Magnetism is known as crossed field device ? What is mode jumping ? How it can be overcome ?

(b) What is slow wave structure ? Give an example of slow wave structure.

(c) Why Si is used to design PNPN device ?

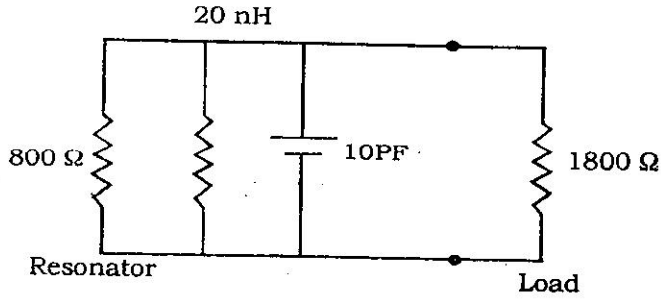
(d) Show that in case of resonator

$$BW = \frac{1}{Q},$$

BW = Band Width, Q = Q factor of resonator.

(e) Explain why a network can not be designed with loss-less, reciprocal and matched at all ports properties.

(f) Consider the loaded parallel resonant circuit as shown in Fig. below. Compute the resonant frequency in loaded Q and unloaded Q.



(g) What is Magic-T junction ? 5×2

2. (a) Show that a 4-port-network having reciprocal lossless and matched at all ports properties forms a directional coupler. Show the conditions for which it will work as symmetric

and Anti symmetric coupler. Also show that a hybrid coupler is a special case of directional coupler. 2+2+2

(b) Design an equal split (-3 dB) lossy and matched at all ports network. Find it scattering matrix. 4

3. (a) With the help of energy band diagram explain how linear diode obtains negative resistance region.

(b) Draw the equivalent circuit model of Linear diode. Find its input impedance and resonant frequency. 5+5

4. (a) State and explain prove Floquet's theorem. Show that periodic structure behaves like slow wave structure.

(b) Find an expression for the Bunching parameter of two cavity Klystron. 4+6

5. A four port network has the following scattering matrix show below . 5×2

$$[S] = \begin{bmatrix} .1\angle 90° & .8\angle -45° & .3\angle -45° & 0 \\ .8\angle -45° & 0 & 0 & .4\angle 45° \\ .3\angle -45° & 0 & 0 & .6\angle -45° \\ 0 & .4\angle 45° & .6\angle 45° & 0 \end{bmatrix}$$

(a) In the network lossless.

(b) In the network reciprocal.

(c) What is the RL at port-1 when all other ports and terminated with matched load.

(d) What is the insertation loss and phase delay between port-2 and port-4 when all other ports are terminated with matched load.

(e) What is the reflection co-efficient seen at port-1 if short circuit is placed at the terminal plane of port-3 and all other ports are terminated with matched load.

6. (a) Draw the equivalent circuit of SCR and find

$$I_A = \frac{I_{CO_1} + I_{CO_2}}{1-(\alpha_1 + \alpha_2)}$$

Notations have their usual meaning.

(b) What are $\frac{dy}{dt}$ and $\frac{dI}{dt}$ triggering ? How a SCR can be protected from such triggering ? How $\frac{dy}{dt}$ and $\frac{dI}{dt}$ rating can be improved ?

(c) How an UJT can be used as relation oscillation ?

3+4+3

[Internal Assessment — 10 Marks]

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