A 251

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Seventh Semester

Electronics and Communication Engineering

EC 432 — MICROWAVE ENGINEERING

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the ABCD parameters of a lossless transmission line.

2. State the 'PHASE SHIFTING' property of S–parameters.

3. State the TWO PARAMETERS that describe a directional coupler. Define them.

4. Calculate the attenuation of a rotary vane attenuator if the angle of rotation is 34°.

5. What is TUNING w.r.t. microwave oscillators? Name them.

6. Draw the electronic admittance spiral of REFLEX KLYSTRON.

7. Draw the equivalent circuits of a PIN diode under (a) Reverse bias and (b) Forward bias.

8. Which two phase angles make the voltage and current in Avalanche transit time devices to be out of phase by 180°?

9. Why is the SLOT located at the centre of the SLOTTED SECTION?

10. What are LOW VSWR and HIGH VSWR and name the method followed to measure HIGH VSWR?

PART B — (5 × 16 = 80 marks)

11. (i) Explain the method of measuring impedance at microwave frequencies.

(ii) Give the relationship of LOADED and UNLOADED Q of a cavity. (12 + 4)

12. (a) (i) Obtain the relationship of S parameters in terms of ABCD parameters.

(ii) Find the S parameters of an ideal transformer of turns ratio 1 : n. (8 + 8)

Or

(b) A certain two-port microwave junction can be represented by the following equivalent circuit. Determine the susceptance B and the turns ratio n of the ideal transformer if the measurements give $S_{11} = \frac{-(1+j)}{3+j}$, $S_{22} = \frac{1-j}{3+j}$. (8 + 8)

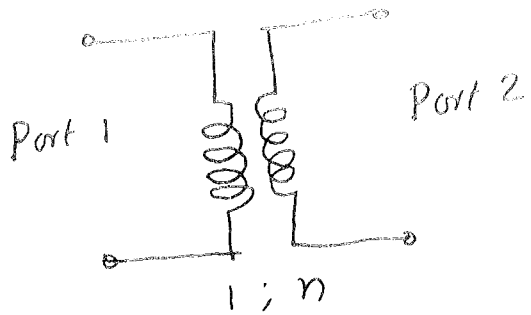

Fig. 1

13. (a) (i) From the first principle, derive the scattering matrix of an ideal directional coupler. Hence or otherwise write down [s] matrix of HYBRID COUPLER and MAGIC–T.

(ii) What is the value of DIRECTIVITY of an ideal DIRECTIONAL COUPLER? Why? (12 + 4)

Or

(b) (i) An isolater, with a characteristic impedance of 50 ohms, has forward and reverse losses of 0.9 dB and 32 dB respectively. Its INPUT and OUTPUT VSWRs are 1.09 and 1.16 respectively when it is terminated by a 50 ohms load. Determine its S parameters. Assume zero phase components.

(ii) Explain how the inductances and capacitances can be varied using IRISES and SCREWS (Posts). (8 + 4 + 4)

14. (a) Derive the expression for the gain of a TWT.

Or

(b) Derive 'HULL CUT OFF' condition and 'HARTREE' condition of a cavity type magnetron

15. (a) (i) Derive 'Manley Rowe Power Relations'.

(ii) Use the above relations to find the power gain of an 'UP' CONVERTER and a DOWN converter. (10 + 3 + 3)

Or

(b) Write in detail the principle mechanism of operation and the application of IMPATT diode. (4 + 8 + 4)