

GANPAT UNIVERSITY

B.Tech. Semester -VII (EC) Regular Examination, Nov-Dec 2012

Microwave Engineering (EC 704)

Max. Time: 3 Hrs.]

[Max. Marks: 70

Instructions:

1. Attempt **all** questions.
2. Answers to the **two** sections must be written in **separate** answer books.
3. Figures to the **right** indicate full marks.
4. **Assume** suitable data, if necessary.

SECTION-I

- | | | | |
|----|-----|---|---|
| 1 | (A) | What are the limitations of conventional tubes at microwave frequencies? Explain it in detail. | 6 |
| | (B) | What is velocity modulation? Discuss in detail about two cavity klystron devices. | 6 |
| OR | | | |
| 1 | (A) | With help of Applegate diagram explain about reflex klystron device. | 6 |
| | (B) | What do you mean by cross field devices? Discuss about cavity magnetron in detail. | 6 |
| 2 | (A) | Describe how the power of a microwave signals from generator to be measured using calorimetric techniques.
Two (30 dB) identical directional couplers are used in a waveguide to sample incident and reflected powers. The outputs of couplers are found to be 2.5mW and 0.15mW. For this data find the value of VSWR. | 6 |
| | (B) | Explain measurement method of impedance using Slotted line. | 5 |
| OR | | | |
| 2 | (A) | Explain measurement method of impedance using Reflectometer. | 6 |
| | (B) | List out various methods to measure VSWR and explain the double minimum method (for $S > 10$) of measuring VSWR. | 5 |
| 3 | (A) | Calculate the SWR of a transmission system operating at 10GHz. Assume TE_{10} wave transmission inside a waveguide of dimensions $a=4\text{cm}$, $b=2.5\text{cm}$. The distance measured between twice minimum power points = 1mm on a slotted line. | 4 |
| | (B) | Explain operation of Varactor diode with required details. | 4 |
| | (C) | Draw the block diagram of monostatic radar system and classify various radars. | 4 |

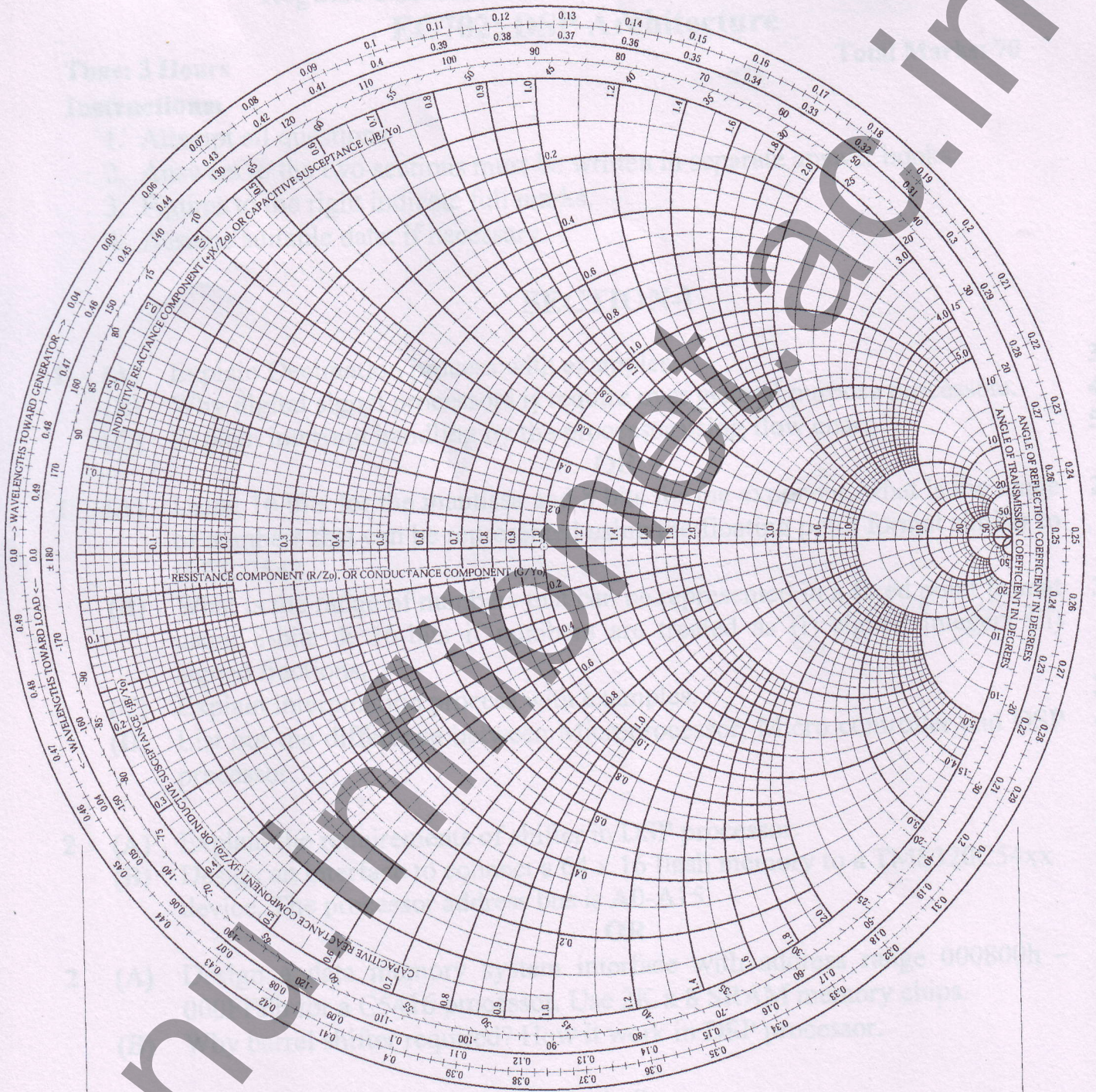
SECTION II

- 4 (A) Determine ρ and S when $Z_0=50\Omega$, $Z_L=100\Omega$. A load impedance of $70-j85\Omega$ is required to be matched to 50Ω co-axial lines at 600 MHz. determine distance of stub from load and length of stub using smith chart. 6
- (B) What is characteristic impedance & reflection co-efficient? Develop the equivalent circuit of a Transmission Line and derive the basic transmission line equations 6
- OR
- 4 (A) Explain the principle of Rat Race Junction. Determine the scattering parameter for a 10 db directional coupler. The Directivity $D=30$ db. Designate the ports in main guide is 1 or 2 and the ports in auxiliary guide as 3 or 4. Assume VSWR at each port is 1.0 under matched conditions. 6
- (B) Derive the equation for phase velocity, group velocity and cut-off frequency for rectangular waveguide. 6
- 5 (A) What is principle of H-plane tee and E -plane tee? Determine S-matrix for Magic tee. Also give application of magic tee. 6
- (B) A rectangular waveguide has dimensions 2.5×5 cms. Determine the guide wavelength, phase constant β and phase velocity V_p at a wavelength of 4.5 cms for the dominant mode. Also derive the equation for wave impedance for TE mode in Rectangular waveguide. 6
- OR
- 5 (A) Derive the equation for Electric and magnetic field component in X and Y direction For TE mode in rectangular waveguide. 6
- (B) What is VSWR? Derive the equation for input impedance on a transmission line. 6
- 6 (A) What is a cavity resonator? Derive the equation for field expression for TM_{mnp} modes in rectangular cavity resonator. 8
- (B) What is mean by degenerate mode? A 50Ω lossless line connects a signal of 300khz to a load of 100Ω . If the load power is 50 Mw; determine (1) V_{min} and V_{max} and (2) impedance at V_{min} and V_{max} . 3

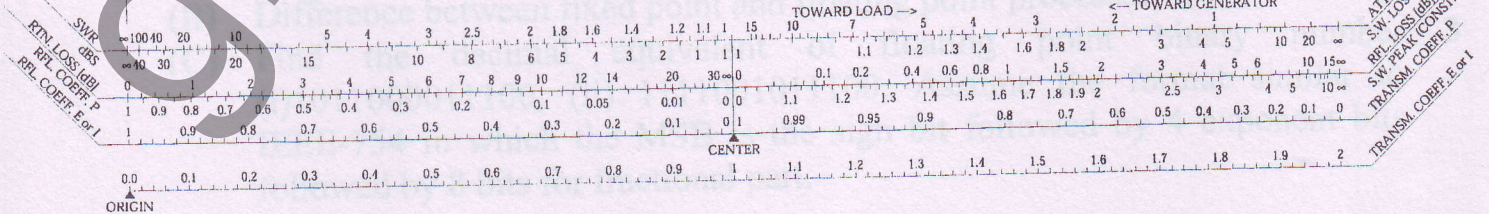
END OF PAPER

The Complete Smith Chart

Black Magic Design



RADIALLY SCALED PARAMETERS



ORIGIN