University ☺f P☺rtland
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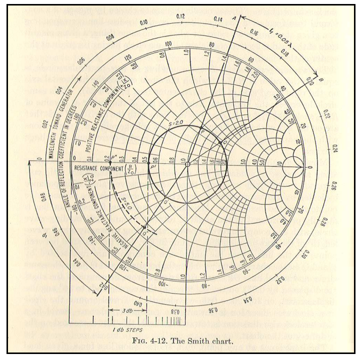
Phillip H. Smith
(1905-1987)



Smith chart

Quizzing your Smith chart skills

The purpose of this quiz is to give you the opportunity to practice basic problems involving the Smith chart.

(1) Impedance point on the Smith chart. On the Smith chart shown in Fig. 1, which one of the following is the normalized impedance corresponding to point A?

(a) 1 (b) 1+*j* (c) 1–*j* (d) *j* (e) –*j*

(2) Impedance point on the Smith chart. On the Smith chart shown in Fig. 1, which one of the following is the normalized impedance corresponding to point D?

(a) 0.146 (b) *j*1.3 (c) –*j*1.3 (d) –1.3 (e) –*j*0.354

(3) Impedance to admittance conversion on the Smith chart. On the Smith chart shown in Fig. 1, if point E represents the value of a normalized impedance, $\overline{Z}_{\mathrm{E}}$, what is the corresponding normalized admittance $\overline{Y}_{\mathrm{E}}$?

(a) 1.5–*j*1.1 (b) 1.3+*j*1.1 (c) 2.6–*j*1.1
(d) 1.3–*j*1.1 (e) 0.46+*j*0.38

(4) Recording standing-wave ratio value on the Smith chart. In Fig. 1, if point A represents the normalized impedance terminating the load end of a lossless transmission line with characteristic impedance Z_0, (i.e., $\overline{Z}_{\mathrm{A}} = Z_{\mathrm{L}}/Z_0$) what is the standing-wave ratio on this line?

(a) ~0.38 (b) ~3.4 (c) ~2.6 (d) ~1.41 (e) ~1

(5) Adding two impedances on the Smith chart. In Fig. 1, if points B and C represent two normalized impedances $\overline{Z}_{\mathrm{B}}$ and $\overline{Z}_{\mathrm{C}}$, which of the following is $\overline{Z}_{\mathrm{B}} + \overline{Z}_{\mathrm{C}}$?

(a) 0.95+j2.45 (b) 0.95+j1.35 (c) 0.05+j2.45
(d) 0.95–j1.35 (e) 0.95–j2.45

(6) Input impedance of a short circuit terminated line. Consider a short-circuit terminated 50 Ω transmission line with electrical length l/λ_1=0.125 at frequency f_1. What is the input impedance of this line at f_1?

(a) 50 Ω (b) j50 Ω (c) –j50 Ω
(d) ∞ (e) 0 (f) 50–j50 Ω

(7) Input impedance at f_2=2f_1. What is the input impedance of the transmission line given in Problem (6) at a frequency f_2=2f_1?

(a) 50 Ω (b) j50 Ω (c) –j50 Ω
(d) ∞ (e) 0 (f) 50+j50 Ω

(8) Input impedance of a terminated line. Consider a 50 Ω-line with electrical length 0.125 terminated with a 50 Ω load. What is the input impedance of this line?

(a) 50 Ω (b) 50+j50 Ω (c) 50–j50 Ω (d) 100 Ω (e) 25 Ω

(9) The position where Z_{in} is real. In Fig. 1, if point E represents the normalized load impedance terminating a transmission line (i.e., $\overline{Z}_{\mathrm{E}} = Z_{\mathrm{L}}/Z_0$), what is the nearest electrical position with respect to the load position where the input impedance of the line is purely resistive?

(a) ~0.25 (b) ~0.182 (c) ~0.318 (d) ~0.13 (e) ~0.12

(10) The position where Re{Z_{in}}=Z_0. In Problem (9), what is the nearest electrical position with respect to the position of the load impedance $\overline{Z}_{\mathrm{E}}$ at which the real (resistive) part of the normalized input impedance of the line is 1 (i.e., Re{Z_{in}}=Z_0)?

(a) ~0.62 (b) ~0.12 (c) ~0.932 (d) ~0.093 (e) ~0.229

(11) The position where Im{Z_{in}}= –0.5Z_0. In Problem (9), what is the nearest electrical position with respect to the position of the load impedance $\overline{Z}_{\mathrm{E}}$ at which the reactive (imaginary) part of the input impedance of the line is –0.5Z_0?

(a) ~0.019 (b) ~0.157 (c) ~0.197 (d) ~0.266 (e) ~0.343

(12) Unknown load. In Fig. 1, assume point A represents the normalized input impedance $\bar{Z}_A = Z_{in}/Z_0$ of a lossless transmission line of electrical length l/λ_1=0.2 terminated with an unknown load $\bar{Z}_L$. What is the normalized load impedance $\bar{Z}_L$?

(a) ~0.4–j0.21 (b) ~0.8–j0.85 (c) ~0.5+j0.5

(d) ~1.7+j1.1 (e) ~1.7–j1.1

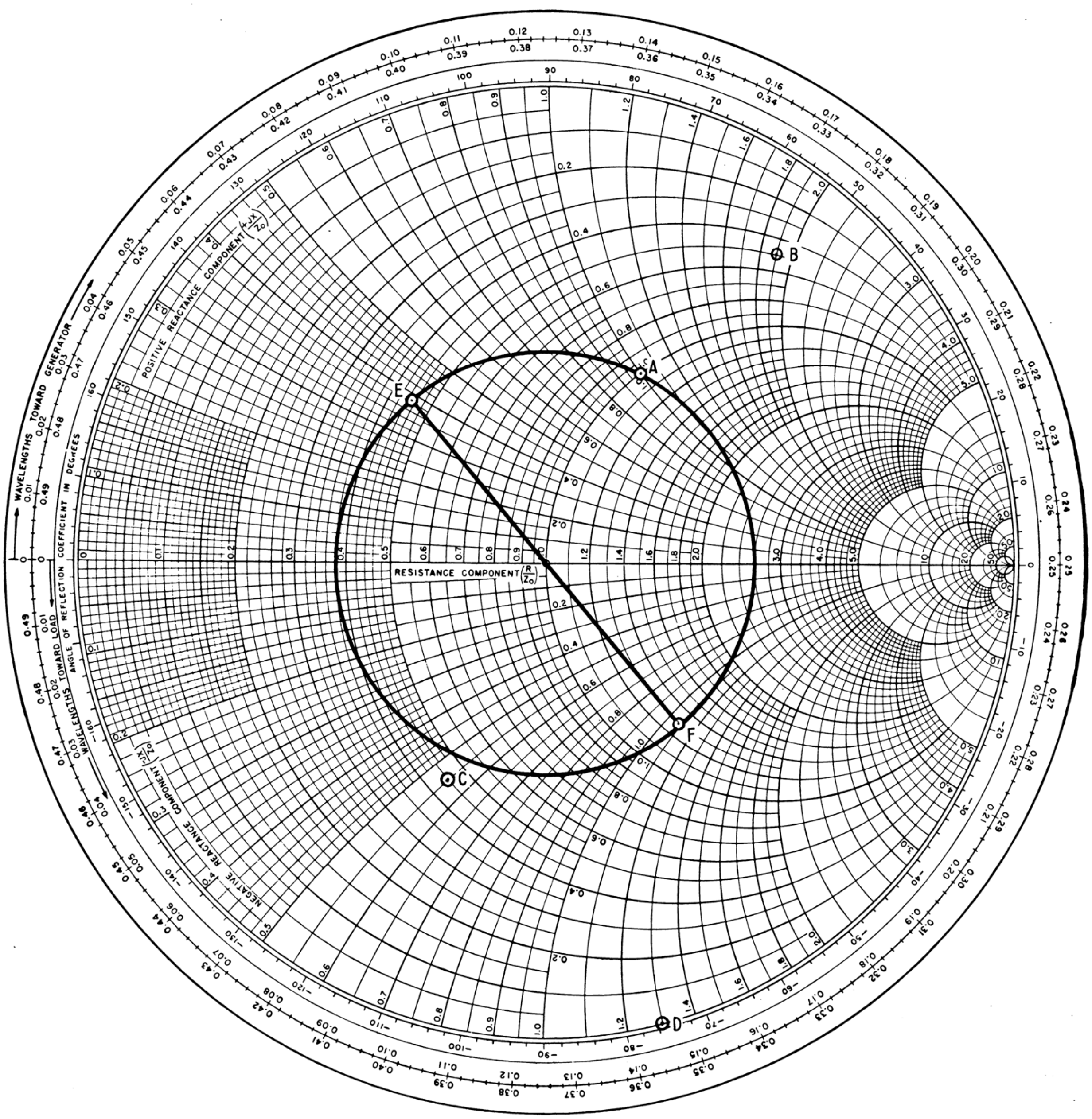


Fig. 1. Smith chart