Menoufia University
Faculty of Electronic Engineering
Dept. of Electronics and Electrical Comm. Eng.
Midterm Examination
Third Year

Subject : Microwave Engineering
Course Code : ECE 323
Allowed Time: 1 Hour
Date : Saturday March 25, 2017
Total Marks : 15 Marks

Name:_____ Sec: _____

Score:

Question 1_____of possible 4 points

Question 2_____of possible 4 points

Question 3_____of possible 5 points

Question 4_____of possible 2 points

Total _____of possible 15 points

Answer the following questions:

Question 1: [4 pts.]

1. The voltage and current expressions that were measured on a lossless transmission line are:

$$v(z,t) = 20\cos(2\pi \times 10^8 t \quad \pi z + \pi/6) + 10\cos(2\pi \times 10^8 t + \pi z)$$
$$i(z,t) = 0.4\cos(2\pi \times 10^8 t \quad \pi z + \pi/6) \quad 0.2\cos(2\pi \times 10^8 t + \pi z)$$

   a. (1 pt.) Determine the voltage phasor.

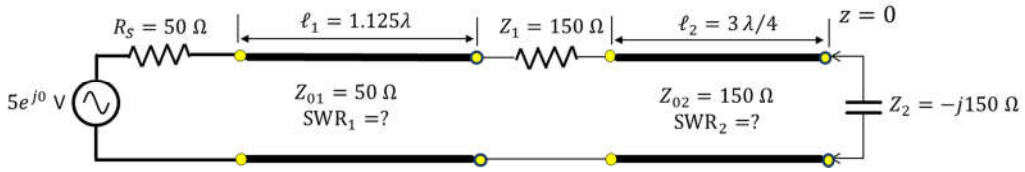
   b. (1 pt.) Determine the current phasor. How could you physically interpret the minus sign?

   c. (1 pt.) Determine the reflection coefficient at the load.

   d. (1 pt.) Determine the impedance of the load.

Question 2: **[4 pts.]**

2. Consider the transmission line circuit below. Assume lossless lines.

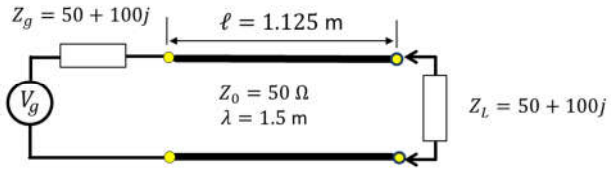


a. (2 pts.) Find the standing wave ratio on each line.

b. (2 pts.) Find the time-average power delivered to each impedance $Z_1 = 150\ \Omega$ and $Z_2 = \ j150\ \Omega$.

Question 3: **[5 pts.]**

3. Consider the transmission line circuit below. Assume lossless line.



a. (1 pt.) Find Z_{in} using the Smith chart and show the constant standing wave ratio (SWR) circle.

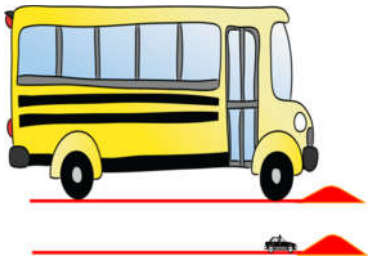
b. (1 pt.) Find the power delivered to the load in terms of V_g.

c. (1 pt.) Find the position of the current maximum nearest the load using Smith chart.

d. (2 pts.) What minimum length of the transmission line will give maximum power delivery to Z_L? Explain (use Smith chart). Find the maximum power delivered to the load in terms of V_g.

Question 4: **[2 pts.]**

I. (1 pt.) What does this picture represent?



II. (1 pt.) Most RF and microwave instruments and coaxial cables have standardized impedance of 50 Ω. Briefly state why?