Started on	Wednesday, 1 May 2024, 10:58 AM
State	Finished
Completed on	Wednesday, 1 May 2024, 12:10 PM
Time taken	1 hour 11 mins
Grade	**28.00** out of 28.00 (**100**%)

Question **1**

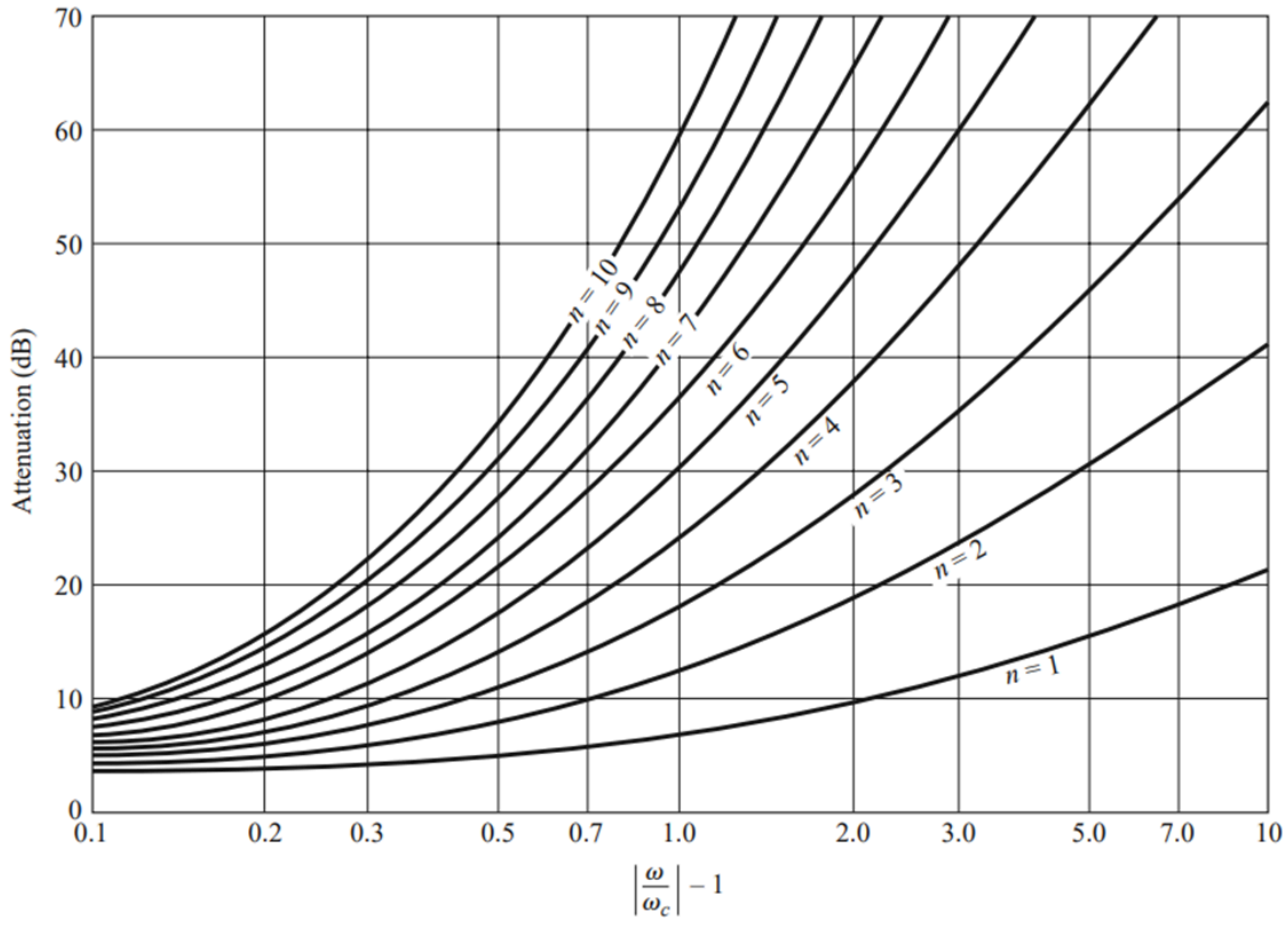
Correct

Mark 1.00 out of 1.00

(2)

Design a stepped-impedance low-pass filter having a maximally flat response and a cutoff frequency of **f1** GHz. It is desired to have more than 20 dB insertion loss at **f2** GHz. The filter impedance is **R** Ω; the highest practical line impedance is 120 Ω, and the lowest is 20 Ω. Consider the effect of losses when this filter is implemented with a microstrip substrate having $d = 0.158$ cm, $\epsilon_r = 4.2$, $\tan\delta = 0.02$, and copper conductors of 0.5 mil thickness.

For the given problem, if f1=4.2 GHz, f2 = 1.6* f1, R=59.7197956591 Ω,



2a) What is the value of N?

Answer: 6 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **2**

Correct

Mark 1.00 out of 1.00

TABLE 8.3 Element Values for Maximally Flat Low-Pass Filter Prototypes ($g_0 = 1$, $\omega_c = 1$, $N = 1$ to 10)

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.0000	1.0000							
4	0.7654	1.8478	1.8478	0.7654	1.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5321	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

2b) For the above circuit, find the respective element value g1:

Answer: 0.5176 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **3**

Correct

Mark 1.00 out of 1.00

2c) What is the value of g2:

Answer: 1.4142 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **4**

Correct

Mark 1.00 out of 1.00

2d) What is the value of g3:

Answer: 1.9318 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **5**

Correct

Mark 1.00 out of 1.00

2e) What is the value of g4:

Answer: 1.9318 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **6**

Correct

Mark 1.00 out of 1.00

2f) What is the value of g5:

Answer: 1.4142 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **7**

Correct

Mark 1.00 out of 1.00

2g) What is the value of g6:

Answer: 0.5176 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **8**

Correct

Mark 1.00 out of 1.00

2h) What is the value of the phase angle βl for the element g1:

Answer: 0.173343 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **9**

Correct

Mark 1.00 out of 1.00

2i) What is the value of the phase angle βl for the element g2:

Answer: 0.703797 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **10**

Correct

Mark 1.00 out of 1.00

2j) What is the value of the phase angle βl for the element g3:

Answer: 0.646955 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **11**

Correct

Mark 1.00 out of 1.00

2k) What is the value of the phase angle βl for the element g4:

Answer: 0.961389 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **12**

Correct

Mark 1.00 out of 1.00

2l) What is the value of the phase angle βl for the element g5:

Answer: 0.473612 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **13**

Correct

Mark 1.00 out of 1.00

2m) What is the value of the phase angle βl for the element g6:

Answer: 0.257591 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **14**

Correct

Mark 1.00 out of 1.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3a) Calculate Γ_L:

Answer: -0.14810 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **15**

Correct

Mark 1.00 out of 1.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3b) Calculate Γ_S:

Answer: -0.29533 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **16**

Correct

Mark 1.00 out of 1.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3c) Calculate Γ_{in}:

Answer: 0.466542 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **17**

Correct

Mark 1.00 out of 1.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3d) Calculate Γ_{out}:

Answer: 0.336836 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **18**

Correct

Mark 2.00 out of 2.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3e) Calculate Transducer gain G_T:

Answer: 3.530591 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **19**

Correct

Mark 2.00 out of 2.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3f) Calculate the magnitude of the determinant of the two port S matrix: $|\Delta|$:

Answer: 0.0189 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **20**

Correct

Mark 2.00 out of 2.00

3) A GaAs MESFET has the following S-parameters at 3.8 GHz with a 50 ohm reference. S11=0.49, S12=0.07, S21=2.39, S22=0.38. The source and load impedances are Z_{Sin} =27.2, ZLout=37.1. $Z^*_{in}=Z^*_{out}$=50 ohm.

3g) Calculate the stability factor: K:

Answer: 11.00165 ✔

Correct

Marks for this submission: 2.00/2.00.

Question **21**

Correct

Mark 1.00 out of 1.00

What are the general criteria for achieving unconditional stability?

- a. K>1 and $|\Delta|$<1 ✔
- b. K<1 and $|\Delta|$<1
- c. K>1 and $|\Delta|$>1
- d. K<1 and $|\Delta|$>1

Correct

Marks for this submission: 1.00/1.00.

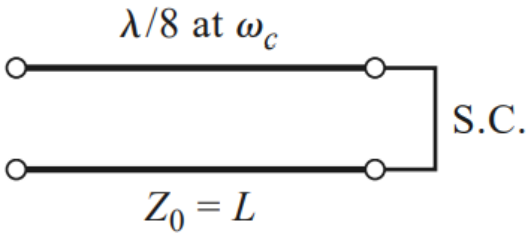
Question **22**

Correct

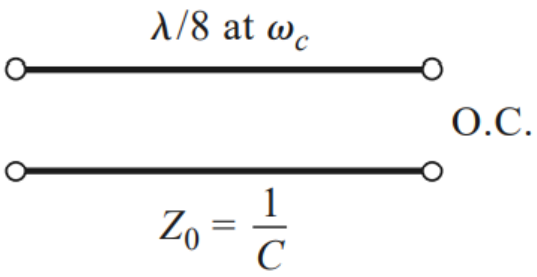
Mark 4.00 out of 4.00

If the equivalents are given with (a), (b), (c) and (d) as below:

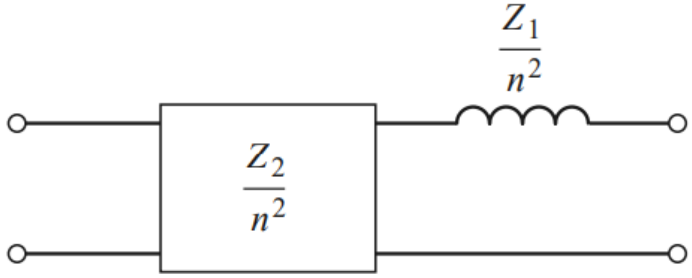
a):



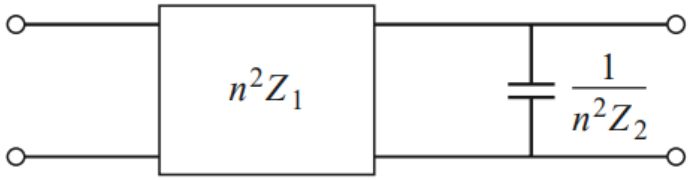
(b):



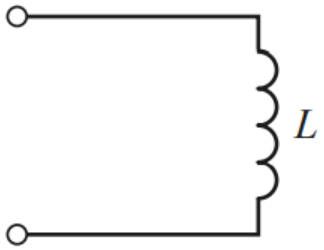
(c)



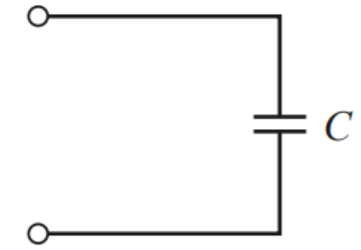
(d)



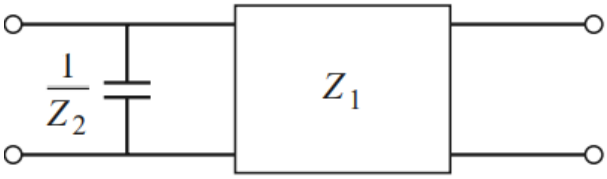
Match the following transformations with above listed equivalents:



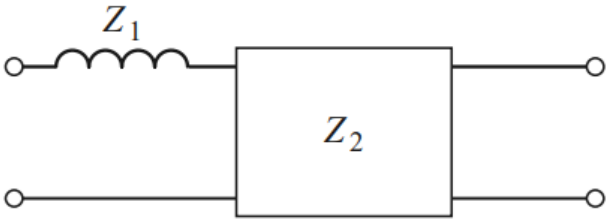
(a) ✔



(b) ✔



(c) ✔



(d) ✔

Correct

Marks for this submission: 4.00/4.00.

◄ Announcements

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