U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 37Ω resistor paralel with a 1.15nH inductor, at 7.1GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.880 + j·1.020 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 26Ω load to a 50Ω source at 7.3GHz. Which is the impedance seen by the source at 2.9 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.35nH/cm and C = 2.65pF/cm, is used as a capacitor at 8.3GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.3 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	154.1°	0	0°	1.749	-13.9°	0.550	-143.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 135μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.090∠-28.5° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 50Ω resistor series with a 0.78nH inductor, at 8.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.730 - j\cdot 0.990$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 50Ω load to a 50Ω source at 9.0GHz. Which is the impedance seen by the source at 3.6 GHz. **(2p)**
4. A λ/10 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.30nH/cm and C = 3.20pF/cm, is used as a capacitor at 12.4GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 9.7 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.692	-167.8°	0	0°	1.966	21.2°	0.560	-118.3°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 135μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.080\angle -13.9°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 25Ω resistor series with a 1.00nH inductor, at 9.4GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.895 - j \cdot 0.750$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 41Ω load to a 50Ω source at 6.7GHz. Which is the impedance seen by the source at 3.9 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.50nH/cm and C = 1.95pF/cm, is used as a capacitor at 14.0GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.7 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.688	103.7°	0	0°	1.686	-27.7°	0.298	153.2°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 105μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.137\angle 4.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 4

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 63Ω resistor paralel with a 1.13nH inductor, at 9.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.025 - j \cdot 1.000$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 37Ω load to a 50Ω source at 7.0GHz. Which is the impedance seen by the source at 4.0 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.90nH/cm and C = 2.80pF/cm, is used as a capacitor at 12.9GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.5 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.660	173.0°	0	0°	1.810	-3.0°	0.555	-135.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 130μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -24.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 5

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 61Ω resistor series with a 1.32nH inductor, at 6.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.290 + j·0.970 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 35Ω load to a 50Ω source at 7.1GHz. Which is the impedance seen by the source at 2.2 GHz. **(2p)**
4. A λ/13 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.80nH/cm and C = 4.85pF/cm, is used as a capacitor at 14.4GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.8 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.871	6.6°	0.560	-128.2°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 140μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.088\angle -20.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 6

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 25Ω resistor paralel with a 0.56pF capacitor, at 7.2GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.740 - j \cdot 1.055$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 50Ω load to a 50Ω source at 7.7GHz. Which is the impedance seen by the source at 2.4 GHz. **(2p)**
4. A λ/6 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.45nH/cm and C = 3.65pF/cm, is used as a capacitor at 7.6GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.0 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.854	4.0°	0.560	-130.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 75μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -21.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 7

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 58Ω resistor paralel with a 0.26pF capacitor, at 9.6GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.725 - j \cdot 0.800$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 43Ω load to a 50Ω source at 9.5GHz. Which is the impedance seen by the source at 2.0 GHz. **(2p)**
4. A λ/14 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.55nH/cm and C = 1.80pF/cm, is used as a capacitor at 14.6GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.0 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	158.0°	0	0°	1.766	-10.0°	0.550	-140.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 110μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -27.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 8

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 57Ω resistor paralel with a 0.55nH inductor, at 8.6GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.190 + j·1.025 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 72Ω load to a 50Ω source at 8.8GHz. Which is the impedance seen by the source at 3.8 GHz. **(2p)**
4. A λ/14 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.15nH/cm and C = 2.00pF/cm, is used as a capacitor at 10.1GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.7 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.880	7.9°	0.560	-127.3°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 120μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.087\angle -19.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 9

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 68Ω resistor series with a 0.49nH inductor, at 8.3GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.815 - j \cdot 1.280$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 63Ω load to a 50Ω source at 7.1GHz. Which is the impedance seen by the source at 2.7 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.75nH/cm and C = 4.60pF/cm, is used as a capacitor at 9.3GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.7 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	148.9°	0	0°	1.726	-19.1°	0.550	-147.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 125μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -30.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 0

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 55Ω resistor paralel with a 0.71nH inductor, at 8.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.935 - j \cdot 0.740$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 48Ω load to a 50Ω source at 9.5GHz. Which is the impedance seen by the source at 3.5 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.45nH/cm and C = 1.65pF/cm, is used as a capacitor at 12.8GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.4 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.906	11.8°	0.560	-124.6°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 120μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.084\angle -18.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 1

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 50Ω resistor series with a 0.99nH inductor, at 7.0GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.925 + j·1.175 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 27Ω load to a 50Ω source at 10.0GHz. Which is the impedance seen by the source at 4.1 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.60nH/cm and C = 2.30pF/cm, is used as a capacitor at 11.2GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.4 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.676	106.4°	0	0°	1.722	-24.4°	0.286	157.4°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 55μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.134\angle 6.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 2

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 32Ω resistor series with a 0.38pF capacitor, at 8.9GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.025 - j \cdot 0.925$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 57Ω load to a 50Ω source at 8.8GHz. Which is the impedance seen by the source at 3.4 GHz. **(2p)**
4. A λ/13 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.60nH/cm and C = 4.65pF/cm, is used as a capacitor at 7.3GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.6 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.888	9.2°	0.560	-126.4°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 50μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.086\angle -19.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 3

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 67Ω resistor series with a 0.25pF capacitor, at 8.9GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.720 + j·1.185 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 47Ω load to a 50Ω source at 9.0GHz. Which is the impedance seen by the source at 2.9 GHz. **(2p)**
4. A λ/8 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.40nH/cm and C = 1.85pF/cm, is used as a capacitor at 11.4GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 9.9 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.684	-170.6°	0	0°	1.948	18.4°	0.560	-120.1°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 70μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.080∠-15.3° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 4

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 57Ω resistor series with a 0.54nH inductor, at 9.7GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.050 + j·1.100 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 62Ω load to a 50Ω source at 7.0GHz. Which is the impedance seen by the source at 3.7 GHz. **(2p)**
4. A λ/14 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.45nH/cm and C = 4.30pF/cm, is used as a capacitor at 11.2GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 13.0 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	145.0°	0	0°	1.709	-23.0°	0.550	-150.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 125μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -32.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 5

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 56Ω resistor series with a 0.37pF capacitor, at 7.0GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.755 + j·1.020 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 53Ω load to a 50Ω source at 9.9GHz. Which is the impedance seen by the source at 4.0 GHz. **(2p)**
4. A λ/10 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.75nH/cm and C = 3.55pF/cm, is used as a capacitor at 13.8GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 9.8 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.688	-169.2°	0	0°	1.957	19.8°	0.560	-119.2°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 55μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.080∠-14.6° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 6

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 48Ω resistor paralel with a 0.30pF capacitor, at 7.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.265 - j \cdot 1.250$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 33Ω load to a 50Ω source at 8.1GHz. Which is the impedance seen by the source at 4.3 GHz. **(2p)**
4. A λ/11 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.05nH/cm and C = 2.75pF/cm, is used as a capacitor at 13.1GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.6 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.684	104.6°	0	0°	1.698	-26.6°	0.294	154.6°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 145μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.136\angle 5.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 7

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 59Ω resistor series with a 1.16nH inductor, at 9.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.070 - j\cdot 0.865$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 71Ω load to a 50Ω source at 7.3GHz. Which is the impedance seen by the source at 2.8 GHz. **(2p)**
4. A λ/14 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.60nH/cm and C = 1.40pF/cm, is used as a capacitor at 14.2GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.5 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.897	10.5°	0.560	-125.5°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 80μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.085\angle -18.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 8

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 28Ω resistor series with a 1.14nH inductor, at 7.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.865 + j·1.135 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 27Ω load to a 50Ω source at 7.4GHz. Which is the impedance seen by the source at 2.8 GHz. **(2p)**
4. A λ/8 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.50nH/cm and C = 4.85pF/cm, is used as a capacitor at 10.0GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.8 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.692	102.8°	0	0°	1.674	-28.8°	0.302	151.8°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 120μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.138\angle 4.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 1 9

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 35Ω resistor paralel with a 0.60nH inductor, at 8.2GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.235 - j\cdot 0.760$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 26Ω load to a 50Ω source at 8.1GHz. Which is the impedance seen by the source at 2.9 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.90nH/cm and C = 2.90pF/cm, is used as a capacitor at 14.8GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.9 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	146.3°	0	0°	1.715	-21.7°	0.550	-149.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 70μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -31.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 0

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 68Ω resistor paralel with a 0.51nH inductor, at 8.7GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.025 + j·1.075 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 46Ω load to a 50Ω source at 9.7GHz. Which is the impedance seen by the source at 3.7 GHz. **(2p)**
4. A λ/12 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.25nH/cm and C = 4.70pF/cm, is used as a capacitor at 14.7GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.5 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	105.5°	0	0°	1.710	-25.5°	0.290	156.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 75μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.135\angle 5.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 1

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 31Ω resistor series with a 1.09nH inductor, at 8.4GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.005 - j \cdot 0.820$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 57Ω load to a 50Ω source at 8.8GHz. Which is the impedance seen by the source at 2.5 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.95nH/cm and C = 4.90pF/cm, is used as a capacitor at 13.7GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.2 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.672	-178.0°	0	0°	1.836	1.2°	0.558	-132.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 100μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -22.2°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 2

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 56Ω resistor series with a 0.54nH inductor, at 9.4GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.180 + j·0.920 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 34Ω load to a 50Ω source at 7.7GHz. Which is the impedance seen by the source at 3.2 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.70nH/cm and C = 1.60pF/cm, is used as a capacitor at 9.0GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.1 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.676	-175.0°	0	0°	1.845	2.6°	0.559	-131.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 50μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.090∠-21.6° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 3

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 39Ω resistor paralel with a 0.66nH inductor, at 8.9GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.825 + j·1.075 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 68Ω load to a 50Ω source at 9.7GHz. Which is the impedance seen by the source at 3.1 GHz. **(2p)**
4. A λ/14 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.55nH/cm and C = 3.15pF/cm, is used as a capacitor at 11.8GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.9 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.863	5.3°	0.560	-129.1°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 140μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.089∠-20.5° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 4

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 40Ω resistor paralel with a 1.19nH inductor, at 6.9GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.765 + j·0.710 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 46Ω load to a 50Ω source at 9.4GHz. Which is the impedance seen by the source at 2.1 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.15nH/cm and C = 2.75pF/cm, is used as a capacitor at 8.7GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.3 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.668	179.0°	0	0°	1.828	-0.2°	0.557	-133.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 85μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -22.8°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 5

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 61Ω resistor series with a 0.25pF capacitor, at 9.2GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.075 - j\cdot 0.760$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 49Ω load to a 50Ω source at 9.0GHz. Which is the impedance seen by the source at 4.3 GHz. **(2p)**
4. A λ/8 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.50nH/cm and C = 4.00pF/cm, is used as a capacitor at 9.6GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 9.6 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.696	-166.4°	0	0°	1.974	22.6°	0.560	-117.4°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 80μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.080\angle -13.2°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 6

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 44Ω resistor series with a 1.24nH inductor, at 8.4GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.175 - j\cdot 0.875$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 48Ω load to a 50Ω source at 7.8GHz. Which is the impedance seen by the source at 3.1 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.55nH/cm and C = 2.50pF/cm, is used as a capacitor at 13.5GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.6 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	150.2°	0	0°	1.732	-17.8°	0.550	-146.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 120μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -30.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 7

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 72Ω resistor paralel with a 0.83nH inductor, at 8.4GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.745 + j·0.985 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 74Ω load to a 50Ω source at 9.8GHz. Which is the impedance seen by the source at 3.8 GHz. **(2p)**
4. A λ/12 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.20nH/cm and C = 3.65pF/cm, is used as a capacitor at 8.2GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.2 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.668	108.2°	0	0°	1.746	-22.2°	0.278	160.2°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 100μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.132\angle 7.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 8

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 55Ω resistor paralel with a 1.62nH inductor, at 7.0GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.860 + j·1.220 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 47Ω load to a 50Ω source at 8.2GHz. Which is the impedance seen by the source at 3.1 GHz. **(2p)**
4. A λ/8 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.55nH/cm and C = 4.20pF/cm, is used as a capacitor at 7.7GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 15.0 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.700	101.0°	0	0°	1.650	-31.0°	0.310	149.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 85μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.140\angle 3.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă "G H E O R G H E A S A C H I" D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 2 9

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 32Ω resistor paralel with a 1.31nH inductor, at 6.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.020 - j\cdot 0.765$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 59Ω load to a 50Ω source at 6.6GHz. Which is the impedance seen by the source at 4.0 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.20nH/cm and C = 4.70pF/cm, is used as a capacitor at 10.1GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.9 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.644	161.0°	0	0°	1.775	-8.6°	0.551	-139.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 100μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -26.4°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 0

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 52Ω resistor series with a 0.48pF capacitor, at 7.4GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.900 - j \cdot 0.900$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 36Ω load to a 50Ω source at 9.3GHz. Which is the impedance seen by the source at 2.8 GHz. **(2p)**
4. A λ/13 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.30nH/cm and C = 3.70pF/cm, is used as a capacitor at 12.2GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.0 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.660	110.0°	0	0°	1.770	-20.0°	0.270	163.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 85μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.130 \angle 8.0°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 1

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 36Ω resistor paralel with a 1.16nH inductor, at 9.9GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.105 + j·0.765 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 72Ω load to a 50Ω source at 9.7GHz. Which is the impedance seen by the source at 2.2 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.75nH/cm and C = 3.30pF/cm, is used as a capacitor at 11.4GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.3 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.914	13.1°	0.560	-123.7°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 145μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.083∠-17.5° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 2

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 46Ω resistor paralel with a 0.60pF capacitor, at 6.7GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.835 + j·0.830 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 72Ω load to a 50Ω source at 10.0GHz. Which is the impedance seen by the source at 2.1 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.70nH/cm and C = 1.60pF/cm, is used as a capacitor at 9.3GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.8 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	147.6°	0	0°	1.720	-20.4°	0.550	-148.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 50μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.090∠-31.0° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 3

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 25Ω resistor series with a 0.30pF capacitor, at 7.8GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.290 - j \cdot 0.755$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 60Ω load to a 50Ω source at 7.0GHz. Which is the impedance seen by the source at 2.0 GHz. **(2p)**
4. A λ/7 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.95nH/cm and C = 3.10pF/cm, is used as a capacitor at 14.9GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.3 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.672	107.3°	0	0°	1.734	-23.3°	0.282	158.8°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 55μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.133 \angle 6.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 4

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 58Ω resistor series with a 1.75nH inductor, at 6.5GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.870 + j·0.705 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 64Ω load to a 50Ω source at 8.2GHz. Which is the impedance seen by the source at 2.9 GHz. **(2p)**
4. A λ/6 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.60nH/cm and C = 1.60pF/cm, is used as a capacitor at 8.1GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.4 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.664	176.0°	0	0°	1.819	-1.6°	0.556	-134.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 60μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.090∠-23.4° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 5

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 66Ω resistor paralel with a 0.54nH inductor, at 7.8GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $1.290 - j\cdot 0.765$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 55Ω load to a 50Ω source at 8.5GHz. Which is the impedance seen by the source at 4.1 GHz. **(2p)**
4. A λ/14 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.00nH/cm and C = 3.50pF/cm, is used as a capacitor at 8.8GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 12.5 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.640	151.5°	0	0°	1.737	-16.5°	0.550	-145.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 55μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -29.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 6

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 42Ω resistor paralel with a 0.94nH inductor, at 7.1GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.045 − j·1.195 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 48Ω load to a 50Ω source at 9.3GHz. Which is the impedance seen by the source at 2.4 GHz. **(2p)**
4. A λ/10 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.80nH/cm and C = 2.00pF/cm, is used as a capacitor at 7.6GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 13.3 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.637	141.1°	0	0°	1.692	-26.6°	0.550	-152.7°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 65μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.090∠-32.6° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 7

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 38Ω resistor paralel with a 0.26pF capacitor, at 9.7GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 0.935 + j·1.065 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 73Ω load to a 50Ω source at 9.1GHz. Which is the impedance seen by the source at 4.4 GHz. **(2p)**
4. A λ/9 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.20nH/cm and C = 1.30pF/cm, is used as a capacitor at 10.1GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 10.0 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.680	-172.0°	0	0°	1.940	17.0°	0.560	-121.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 70μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.080∠-16.0° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 8

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 44Ω resistor series with a 0.48nH inductor, at 8.8GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.885 - j \cdot 0.875$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 57Ω load to a 50Ω source at 7.5GHz. Which is the impedance seen by the source at 2.2 GHz. **(2p)**
4. A λ/8 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 2.05nH/cm and C = 2.50pF/cm, is used as a capacitor at 8.0GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 14.1 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.664	109.1°	0	0°	1.758	-21.1°	0.274	161.6°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 110μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.131 \angle 7.5°$ check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 3 9

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 72Ω resistor series with a 0.62pF capacitor, at 9.0GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to 1.060 + j·0.940 compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 56Ω load to a 50Ω source at 7.4GHz. Which is the impedance seen by the source at 3.0 GHz. **(2p)**
4. A λ/11 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.00nH/cm and C = 1.20pF/cm, is used as a capacitor at 8.5GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 11.7 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.652	167.0°	0	0°	1.792	-5.8°	0.553	-137.0°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 105μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of S_{12} = 0.090∠-25.2° check whether the transistor is stable with the match you designed at a). **(1p)**

U N I V E R S I T A T E A T E H N I C Ă " G H E O R G H E A S A C H I " D I N I A Ş I
Faculty / Department: Electronics, Telecommunications and Information Technology
Domain: Telecommunication Technologies and Systems
Course : MDCR - EDOS412T
Enrollment Year: ___4____, Examination Session _____January_____ / __2019

S U B J E C T N o . 4 0

Time allowed: 2 hours; All materials/equipments authorized

Instructor: conf. Radu Damian Student: _____ Grupa_____

Note. Except where otherwise specified, assume 50Ω reference impedance.
Note. Any CAD solution (Matlab, Mathcad, ADS) must be accompanied by the submission of the script/project at the end of the examination.

1. For a load composed from a 26Ω resistor series with a 0.67nH inductor, at 9.8GHz, compute the normalized admittance **(1p)** and the normalized impedance **(1p)**.
2. For a normalized impedance equal to $0.900 - j\cdot 0.990$ compute the corresponding reflection coefficient **(0.5p)** and then plot on a Smith Chart (only the external circle and the complex plane axes) the corresponding point **(0.5p)**.
3. A quarter wave transformer is designed to match a 65Ω load to a 50Ω source at 8.2GHz. Which is the impedance seen by the source at 3.0 GHz. **(2p)**
4. A λ/12 section of an open-circuited transmission line, with parameters (per unit length) R = G = 0, L = 1.30nH/cm and C = 4.65pF/cm, is used as a capacitor at 11.7GHz. Find the value of the capacitance. **(2p).**
5. The scattering parameters of a transistor at 13.2 GHz are as follows:

S_{11}		S_{12}		S_{21}		S_{22}	
Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
0.638	142.4°	0	0°	1.698	-25.4°	0.550	-151.8°

   a) Design the match at both input and output with single-stub matching sections (shunt stub solution) which offers maximum gain. **(1.5p)**
   b) Draw the match schematic. (**0.5p**)
   c) Which is the transducer power gain we obtain in this case (in dB)? (**1p**)
   d) For a 105μW input signal compute the power of the output signal (both mW and dBm). **(1p)**
   e) If however you know the real value of $S_{12} = 0.090\angle -32.4°$ check whether the transistor is stable with the match you designed at a). **(1p)**