**ECSE 597 Assignment 3**

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**Q1.**

文本

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Fig 1. Code of BE method.

图表

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Fig 2. Result of testbench q1.

The result of testbench q1 show that the transient response is consistent with steady state response when time is larger than 6 ms, which is a sine wave.

**Q2.**

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Fig 3. Code of TR method.

图表

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Fig 4. Result of testbench q2.

The result of testbench q2 shows that all 3 outputs are consistent when time is large. For BE method, h=1 is more accurate than h=10 compared to the plot of TR. Moreover, when step size is fixed (for example, h=10 in the plot above), TR provides a more accurate result than BE.

**Q3.**

文本

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Fig 5. Code of FE method.

图表

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Fig 6. Result of FE when step size h=60 ps.

图表, 折线图, 直方图

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Fig 7. Result of FE when step size h=1 ps.

图表

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Fig 8. Other results of testbench q3.

Fig 6 and fig 7 shows that for FE, when step size is too large, the output will diverge. Fig 8 shows that for BE and TR, convergence is not a problem to worry about: the output will always converge no matter how large the step size is.

By using MATLAB, the eigenvalues found are: -3.532e10, -2.3473e10, -1e10 and -0.1206e10. Since the stability condition for FE is |1+h\*λ|<1, we could conclude that the stability condition for this circuit netlist is 0<h<5.66e-11. This would explain the plots shown in fig 6 and fig 7, where 6e-11 is out of the stability boundary.

**Q4.**

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图形用户界面, 文本, 应用程序

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Fig 9. Code of sensitivity analysis using perturbation method.

**Q5.**

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Fig 10. Code of sensitivity analysis using differentiation method.

**Q6.**

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文本

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Fig 11. Code of sensitivity analysis using adjoint method.

**Q7.**

The absolute sensitivity of R1 and C1 are shown below in fig 12, 13, 14 and 15.

图表

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Fig 12. Absolute sensitivity of R1.

图表, 折线图

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Fig 13. Relative sensitivity of R1.

图表

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Fig 14. Absolute sensitivity of C1.

图表, 折线图

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Fig 15. Relative sensitivity of C1.

The relative sensitivity of all other elements computed in 3 ways are shown below in fig 16, 17, 18 and 19.

图表, 折线图

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Fig 16. Relative sensitivity of C2.

图表, 折线图

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Fig 17. Relative sensitivity of R2.

图表, 表格

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Fig 18. Relative sensitivity of R3.

图表

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Fig 19. Relative sensitivity of R4.