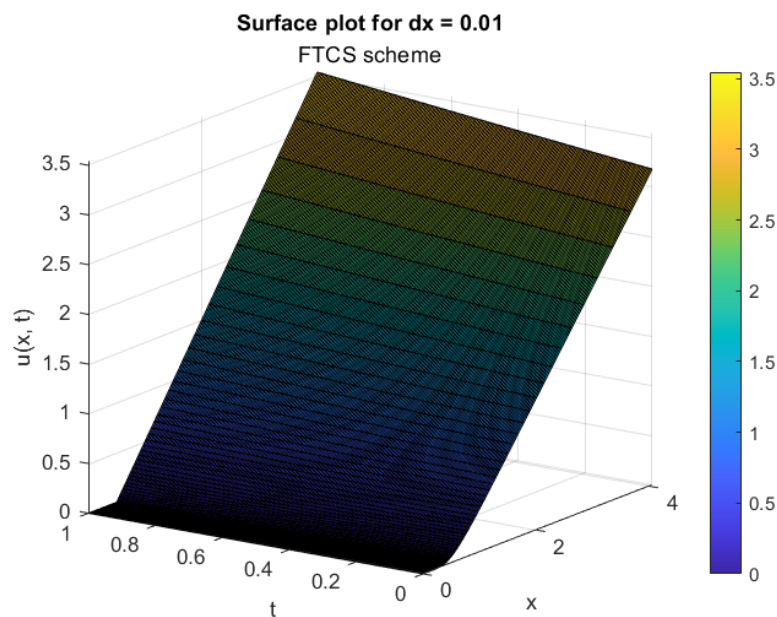


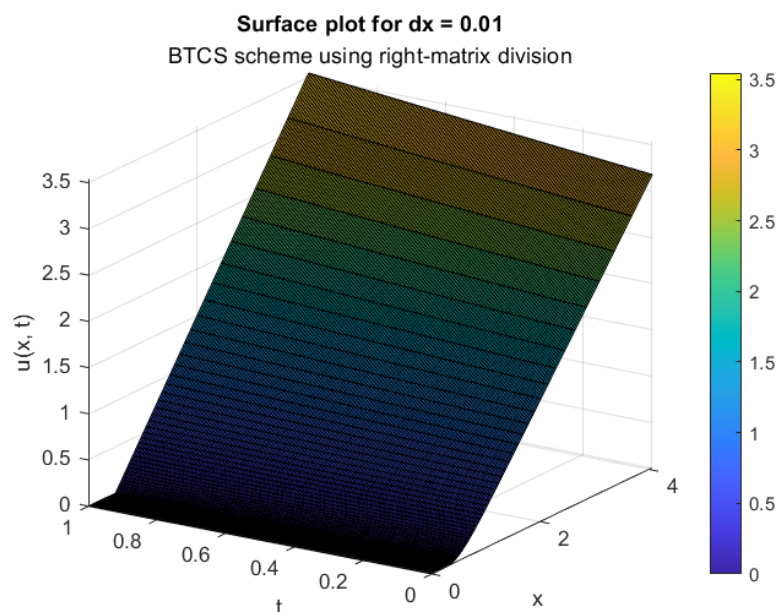
1 QUESTION - 1:

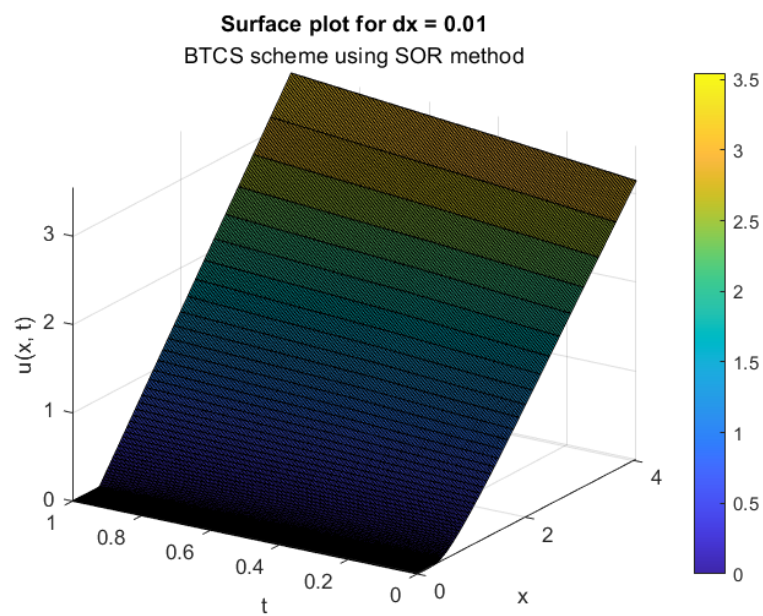
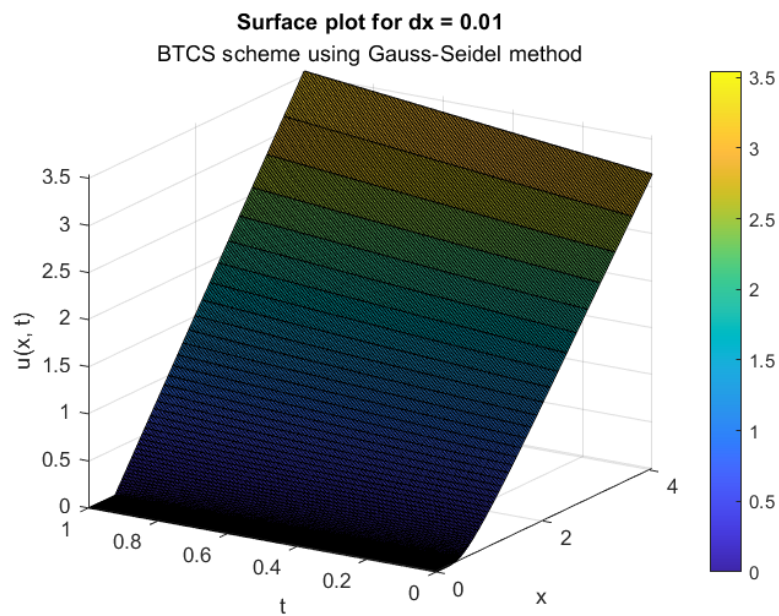
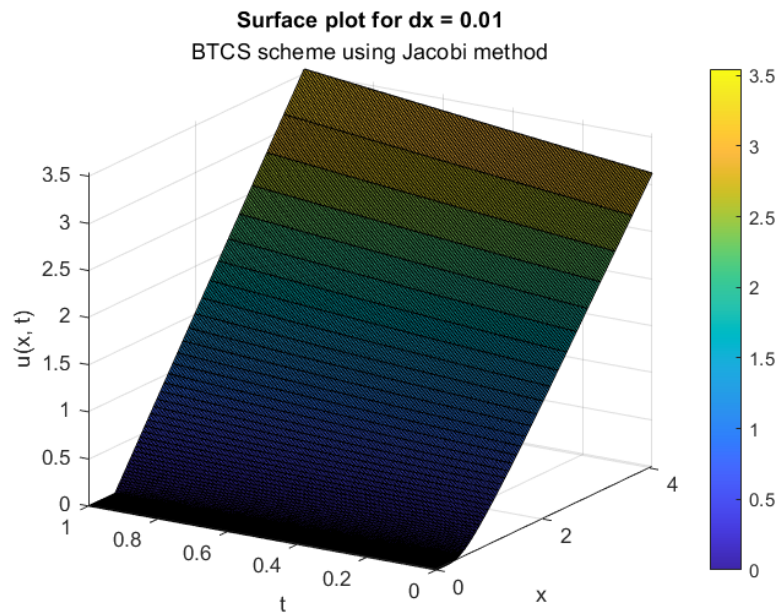
The surface plots for the solution of the Black Scholes PDE for European Call using different schemes are:

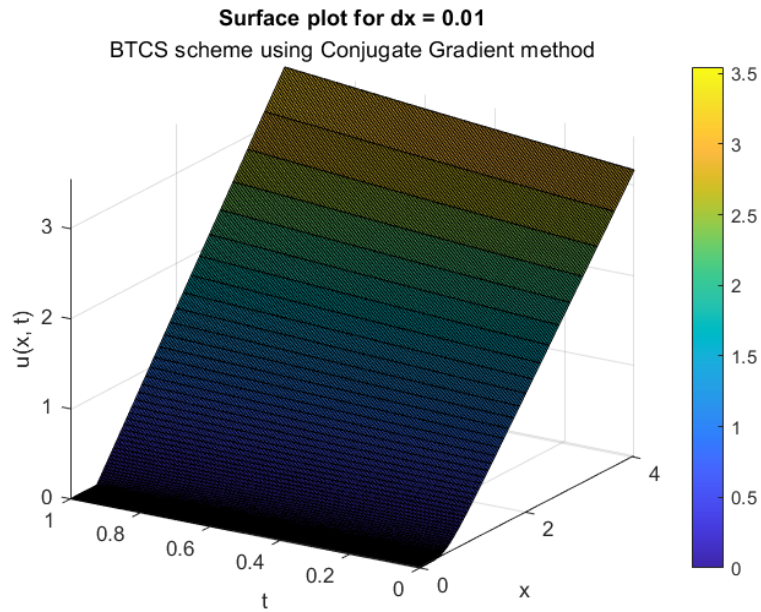
i. FTCS scheme



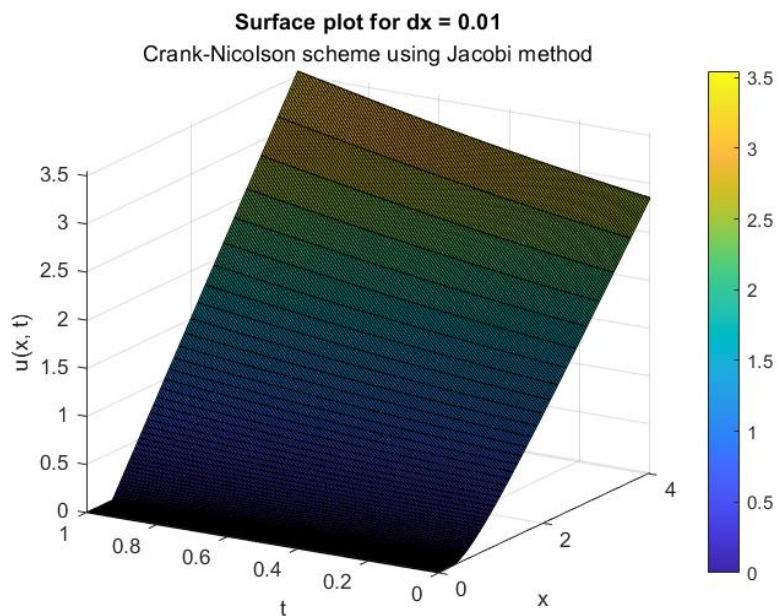
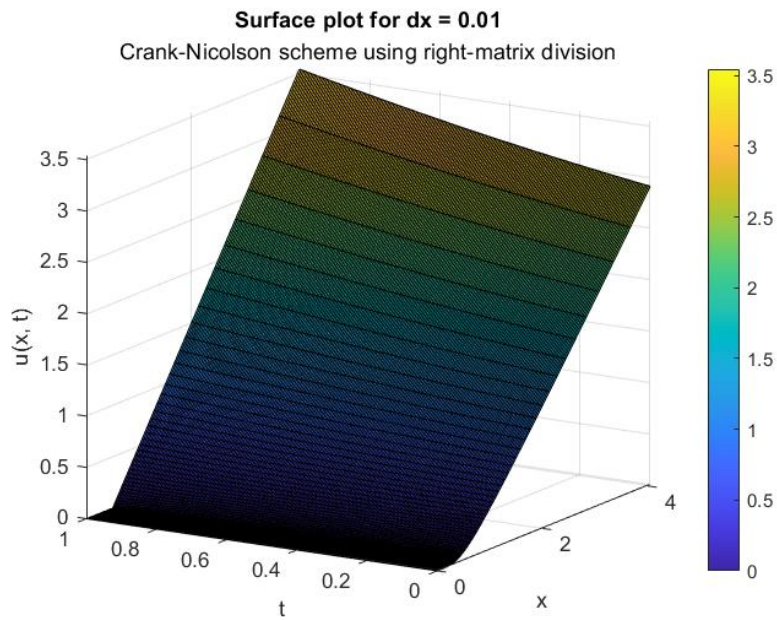
ii. BTCS scheme:

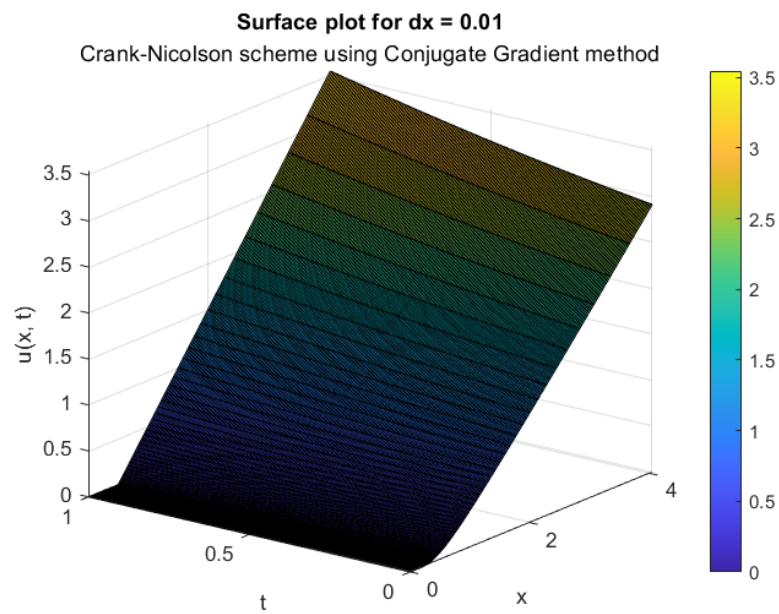
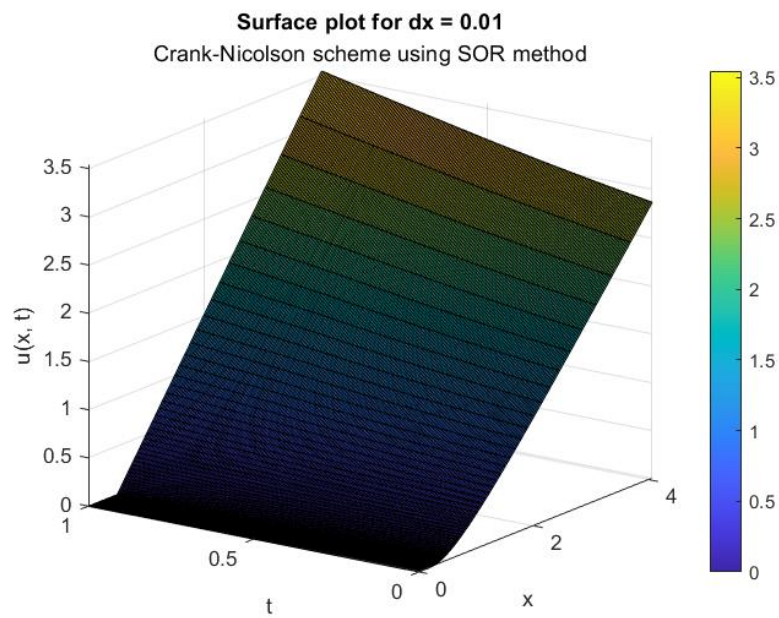
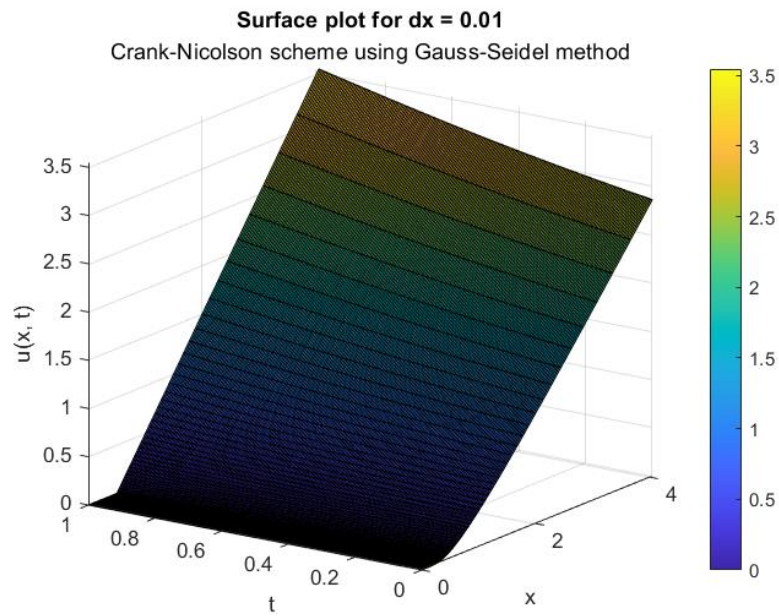






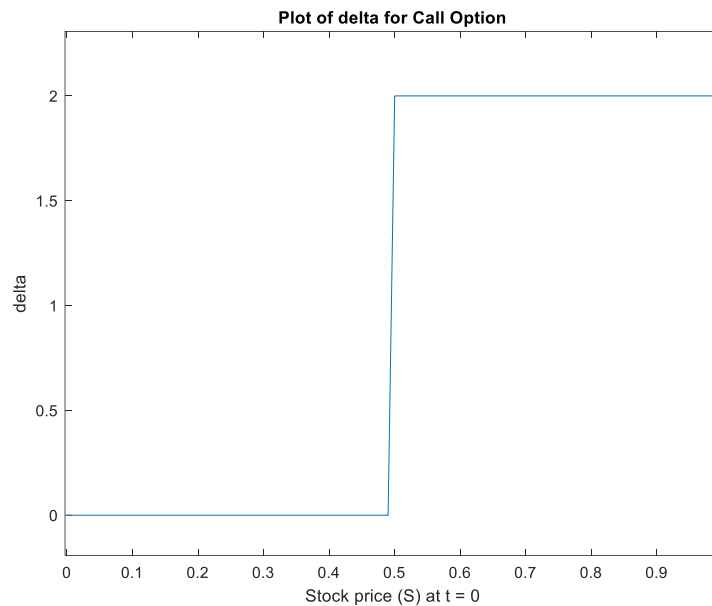
iii. Crank Nicolson scheme:



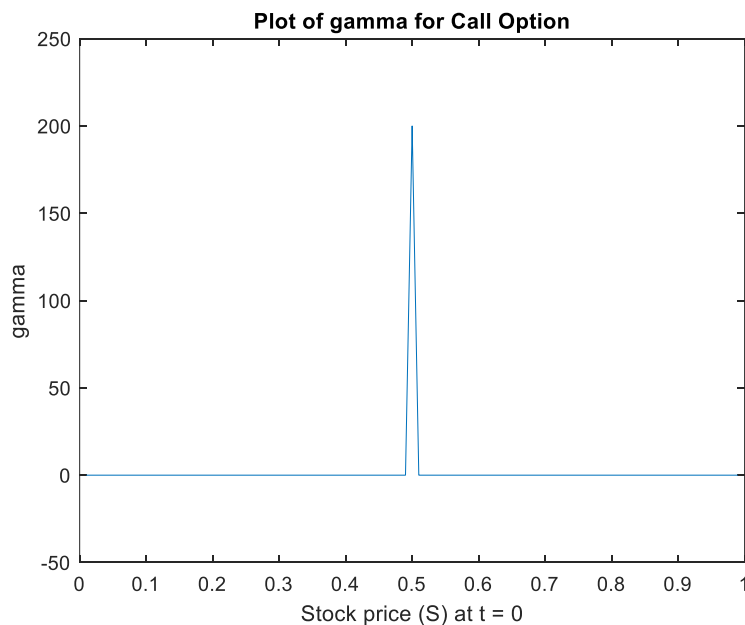


Greeks:

1. Delta -



2. Gamma -



Observations:

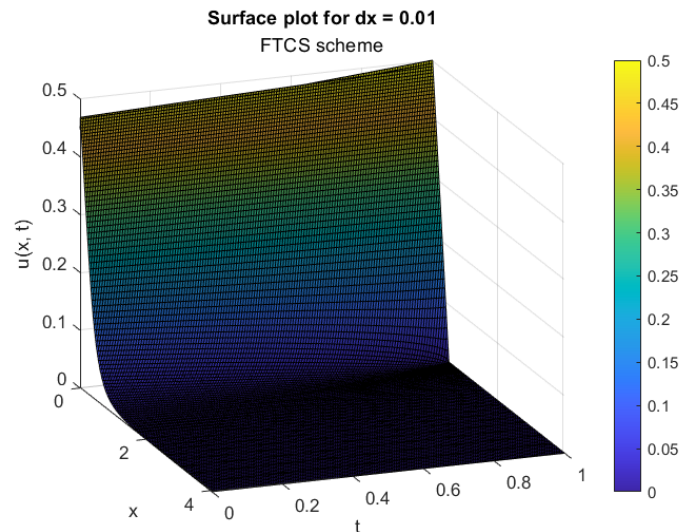
We can observe that the price of the European call increases as S (denoted by x) increases, and so the surface formed is within the theoretical expectations.

More general observations are specified at the end of the report.

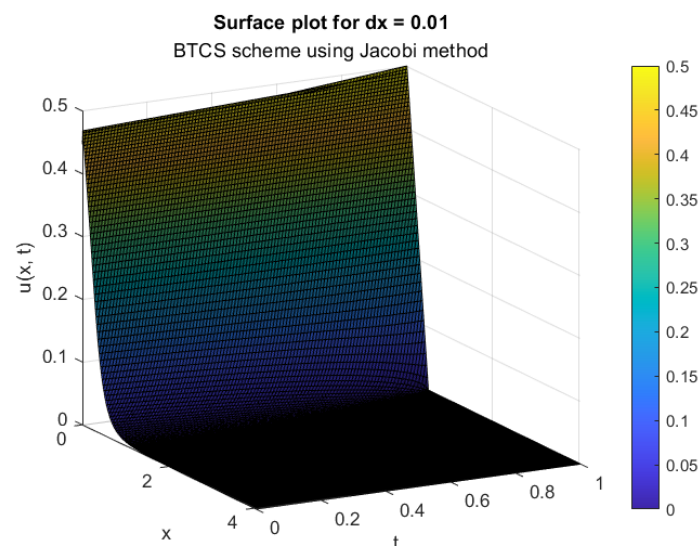
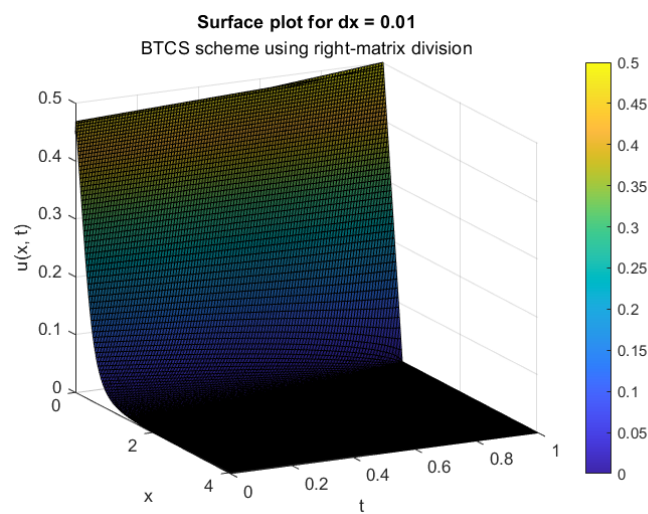
2 QUESTION - 2:

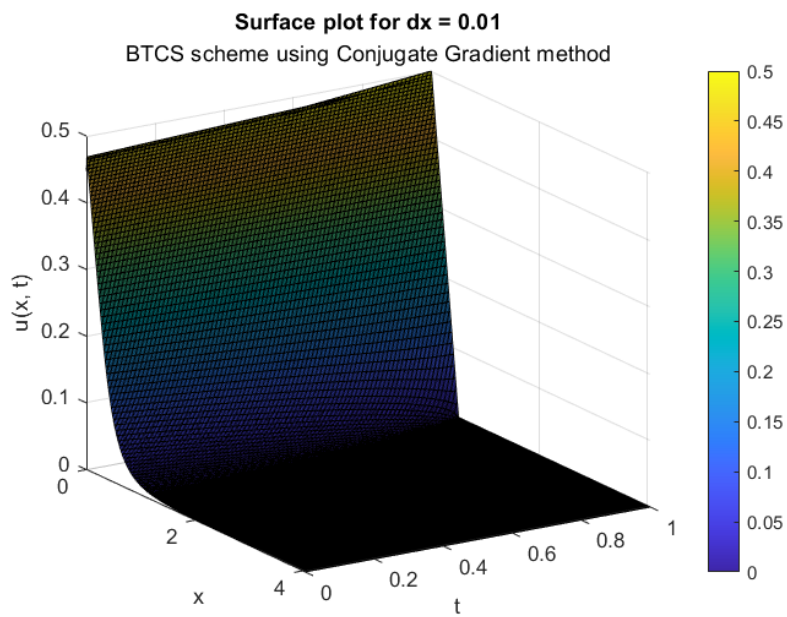
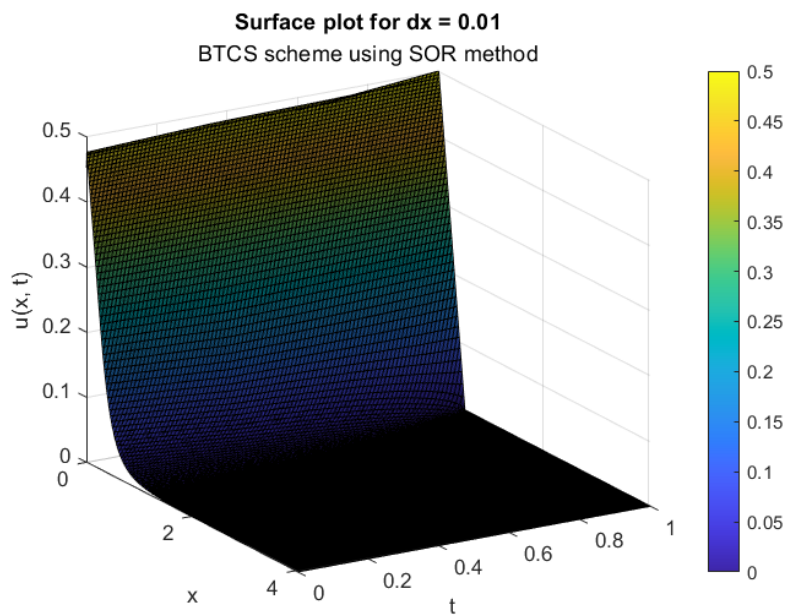
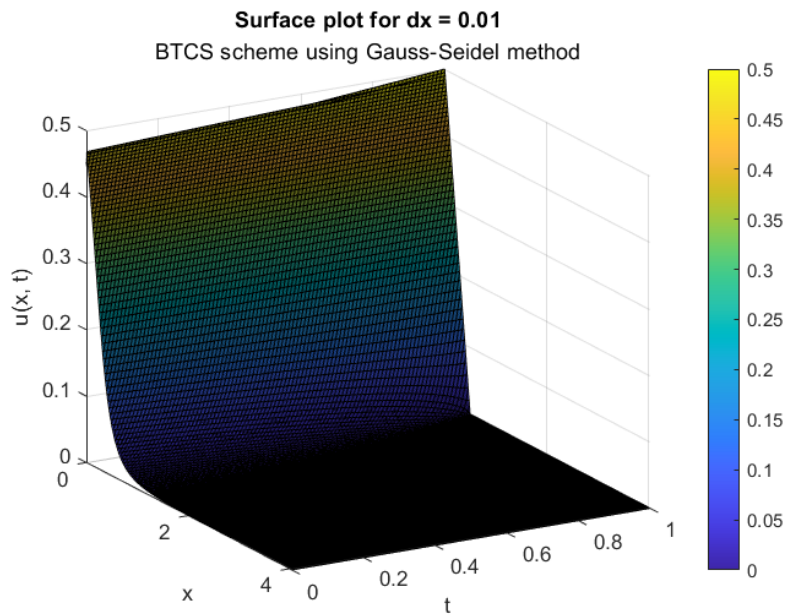
The surface plots for the solution of the Black Scholes PDE for European Put using different schemes are:

i. **FTCS scheme:**

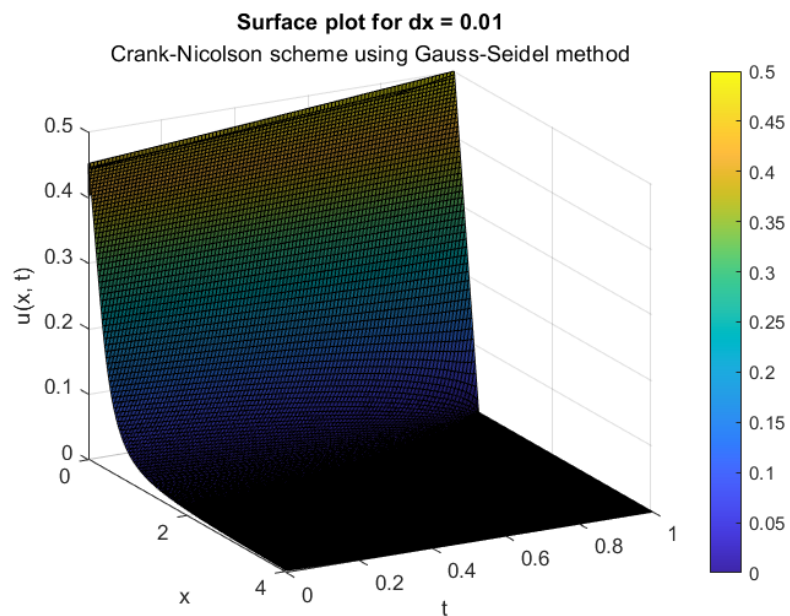
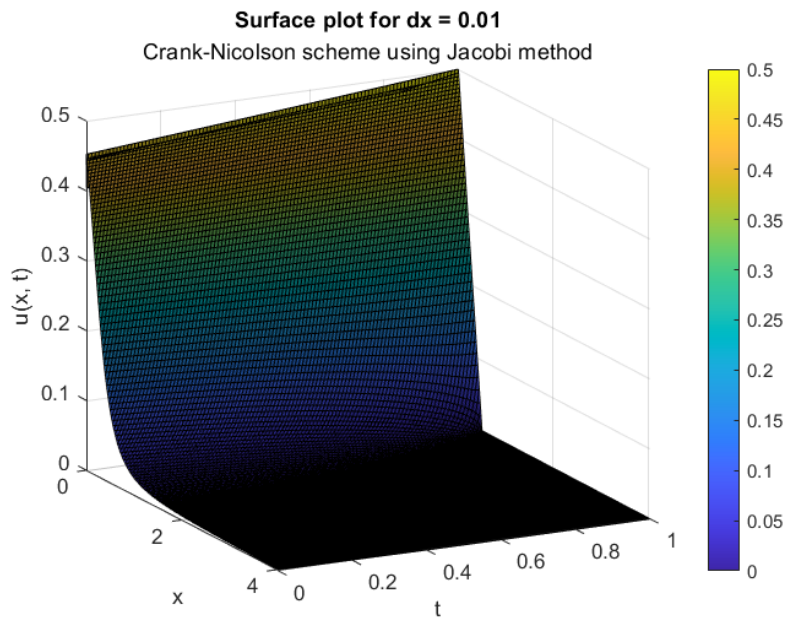
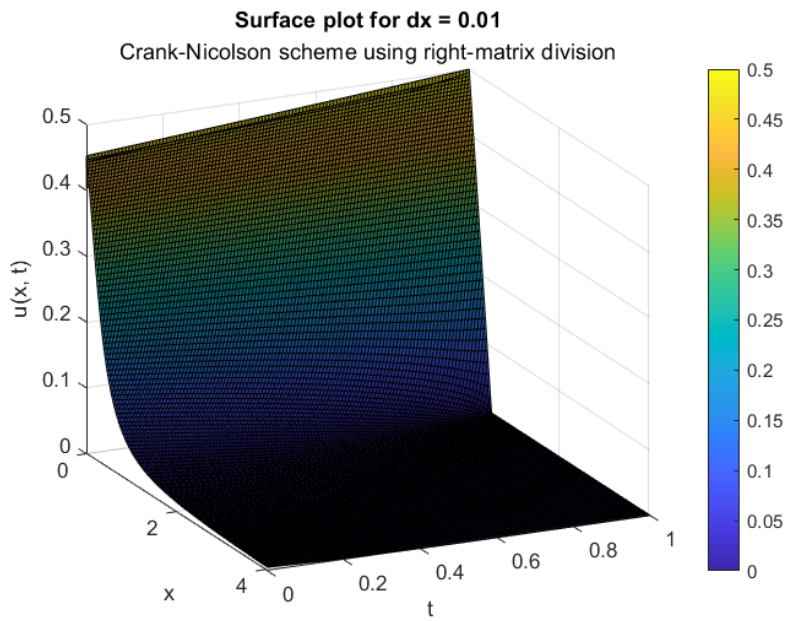


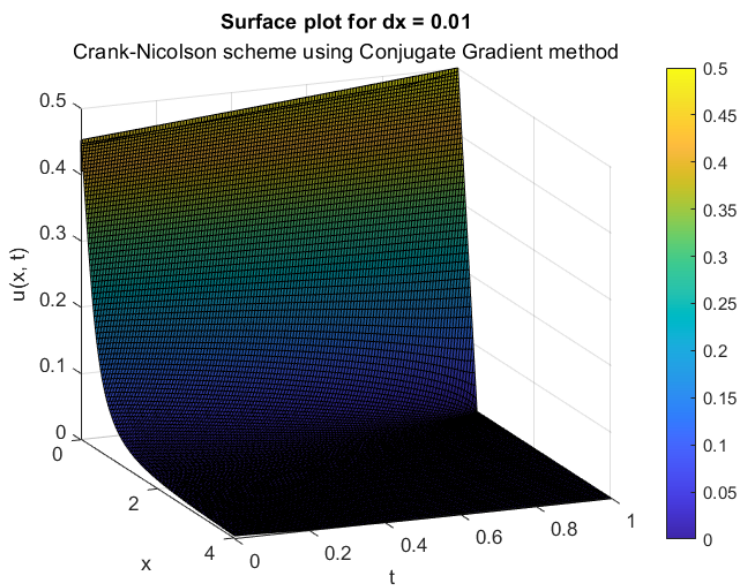
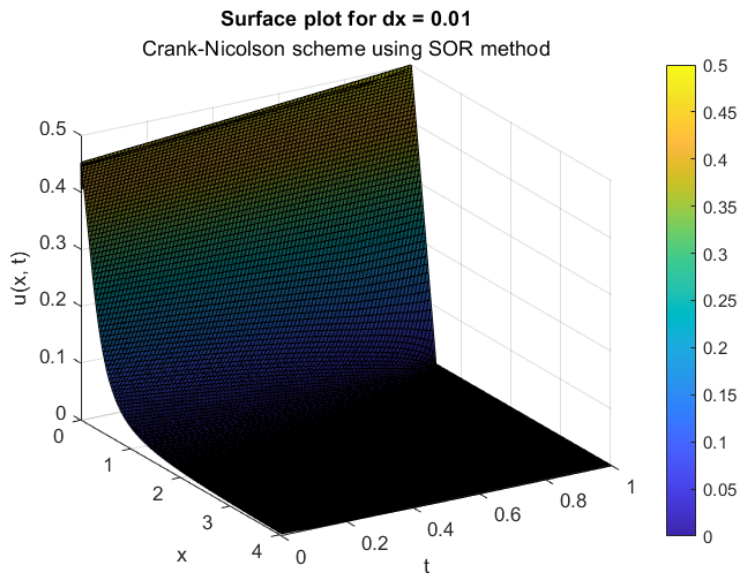
ii. **BTCS scheme:**





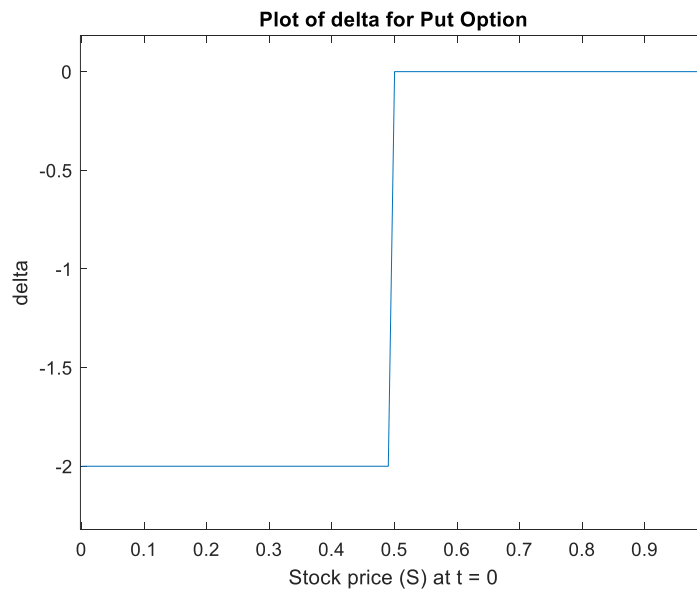
iii. Crank Nicolson scheme:



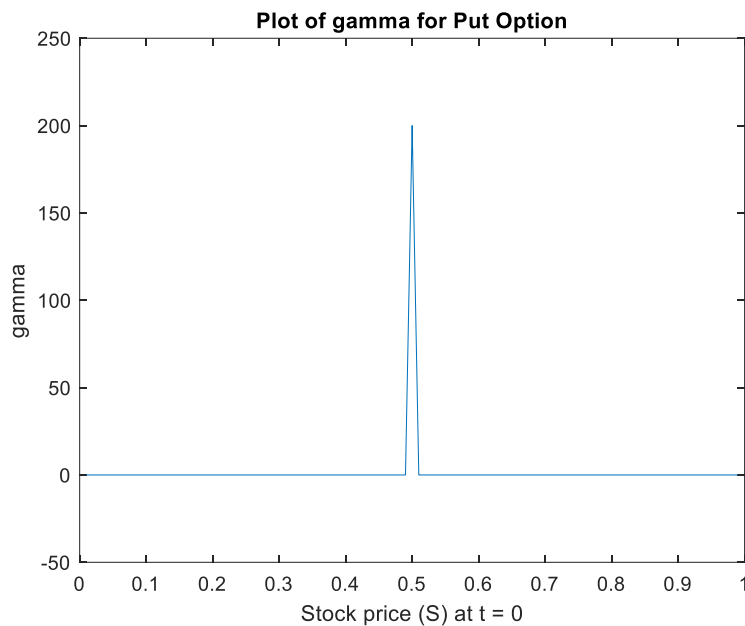


Greeks:

1. Delta -



2. Gamma -



Observations:

- We can observe that the price of the European put decreases as S (denoted by x) increases, and so the surface formed is within the theoretical expectations.
- Along with this, iterative methods are also used to solve the system of linear equations, $Ax = b$ and relevant plots are created (in BTCS and Crank Nicolson schemes).
- Following iterative methods are implemented:
 - i. Jacobi Iteration method
 - ii. Gauss-Seidel Iteration method
 - iii. SOR (Successive Over Relaxation) method
 - iv. Conjugate Gradient method
- The plots of Greeks (delta and gamma) are also plotted. These plots show a slight deviation from their original nature. This can be attributed due to the fact that the plots are drawn for the transformed variables. Due to the transformation, the plots can't be drawn for the original variables. So they are drawn for the transformed ones, and thus, show a slight deviation from their original nature.
These deviations can be removed if the PDE is solved without any transformation, and plots are drawn thereby.