MA 374 (2025) **Financial Engineering Lab** **Lab 01**

General Instructions for MA 374 (Applicable for all Lab Assignments)

- *Please create a folder with the last two digits of your Roll Number, IITG Email ID and the Lab Assignment Number. For example, if your Roll Number is "220123099", your IITG Email ID is "x.yz" and the Lab Assignment is "Lab 09" then you have to create a folder "**99x.yzMA374lab09**".*
- *All your programs and output files (in Word/LaTeX and PDF format) must be put inside the folder created as per the above specification.*
- *Finally, the folder must be zipped as a .zip file and uploaded on MS Teams Group for the course, under the "Assignments" tab, within the deadline.*

Write a program, using the basic binomial pricing algorithm, to determine the price of an European call and an European put option (in the binomial model framework) with the following data :

$$S(0) = 9; K = 10; T = 3; r = 0.06; \sigma = 0.3.$$

Take $u = e^{\sigma\sqrt{\Delta t}+\left(r-\frac{1}{2}\sigma^2\right)\Delta t}$ and $d = e^{-\sigma\sqrt{\Delta t}+\left(r-\frac{1}{2}\sigma^2\right)\Delta t}$, where $\Delta t = \dfrac{T}{M}$, with M being the number of subintervals in the time interval $[0, T]$. Use the continuous compounding convention in your calculations (i.e., both in $\tilde{p}$ and in the pricing formula).

(A) Run your program for $M = 1, 5, 10, 20, 50, 100, 200$ to get the initial option prices and tabulate them.

(B) How do the values of options at time $t = 0$ compare for various values of M? Compute and plot graphs (of the initial option prices) varying M, in steps of 1 and in steps of 5. What do you observe about the convergence of option prices?

(C) Tabulate the values of the options at $t = 0, 0.30, 0.75, 1.50, 2.70$ for the case $M = 20$.

Note that your program should check for the no-arbitrage condition of the model before proceeding to compute the prices.

Submission Deadline: 8th January 2025, 11:59 PM