Department of Mathematics

Indian Institute of Technology Guwahati

Mid Semester Examination September 22, 2021

MA 473 Computational Finance (Part – II)

Time: **10:00 – 11:00 Hrs.** Marks: **15**

There are ***THREE*** questions in this paper. Answer all questions.

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3. Determine the condition for stability of the forward-time and central space (FTCS) scheme for the 1D parabolic PDE $u_t = u_{xx}$ with suitable initial and boundary conditions. (**4** marks)

4. Show that the following *Cryer* problem:

$$\begin{cases} \text{Find vectors } x \text{ and } y \text{ such that for } \hat{b} := b - Ag \\ Ax - y = \hat{b}, \quad y \geq 0, \quad x^T y = 0, \end{cases}$$

   is equivalent to the minimization problem:

$$\min_{x \geq 0} G(x), \quad \text{where } G(x) = \frac{1}{2}(x^T A x) - b^T x, \text{ is strictly convex.} \qquad (\textbf{5} \text{ marks})$$

5. Show that the early-exercise curve $S_f(t)$ (for $t < T$) for the American put option admits the following upper bound:

$$S_f(t) \; < \; \lim_{t \to T} S_f(t) \; = \; \min\left(K, \frac{r}{\delta} K\right). \qquad (\textbf{6} \text{ marks})$$
