

MC – 306 Financial Engineering

Time : 90 mins

Max. Marks: 25

Note: Attempt all questions. All question carry equal marks.

Assume missing data , if any.

1. Let $B(0) = \text{Rs. } 100, B(1) = \text{Rs. } 105$ and $S(0) = \text{Rs. } 75$. Also, let $S(1) = \begin{cases} \text{Rs. } 88, & \text{with probability } p = 0.60 \\ \text{Rs. } 69, & \text{with probability } p = 0.40. \end{cases}$
Design a portfolio with initial wealth of Rs. 5, 000, split in the ratio of 2:3 between stock and bond. Compute the expected return and the risk of the portfolio so constructed.
2. Let $S(0) = \text{Rs. } 110, u = 1.1, d = 0.9$ and $r = 5\%$. Consider a call option with strike price $K = \text{Rs. } 130$ and $T = 2$. Find the option price and the replicating strategy.
3. If $S(0) = A(0)$, then prove that $S^d < A(1) < S^u$, or else an arbitrage opportunity would arise.
4. A non-dividend paying stock is currently selling at Rs. 125 with annual volatility 18%. Assume the continuously compounded risk free interest rate is 5%. Using a two period CRR binomial option pricing model find the price of one European call option on this stock with a strike price of Rs. 160 and time to expiration 3 years.
5. The stock price is Rs. 80. The annual continuously compounded risk free interest rate is 7% and the annual volatility relevant for the Black-Scholes formula is 14%. Call options are written with a strike price of Rs. 75 and time to expiration of 3 years. Use Black-Scholes formula to find the price of one such call option.