

# KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

## DEPARTMENT OF MATHEMATICS & STATISTICS

### AS498 - Section 01 (Term 161)

Date: December 08, 2016

Quiz 4

Duration: 30 minutes

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Family Name: \_\_\_\_\_ ID #: \_\_\_\_\_ Serial #: \_\_\_\_\_

1. Let  $S(t)$  be the time- $t$  price of a stock. You are given:

- (i) The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 2.5%.
- (ii) The stock price process is:

$$\frac{dS(t)}{S(t)} = 0.075dt + 0.3dZ(t)$$

where  $Z(t)$  is a standard Brownian motion.

- (iii) Let  $V(s, t)$  be the time- $t$  price of a derivative written on  $S$ , when the time- $t$  stock price is  $s$ . Then  $V(s, t)$  satisfies:

$$V_t(s, t) + 0.045V_s(s, t)s + k_1V_{ss}(s, t)s^2 + k_2V(s, t) = 0$$

where  $k_1$  and  $k_2$  are constants.

Find  $k_1 + k_2$ .

**(10 points)**

2. Consider a non-dividend paying stock that follows a geometric Brownian motion. You are given:

(i) The stock's volatility is 30%.

(ii) The continuously compounded risk-free interest rate is 4.5%.

(iii) A 1-year at-the-money European call option on the stock has a current price of 13.990126.

Calculate the price of a 2-year European put option that has a strike price of 1.1 times the current price of the stock. **(10 points)**