Question 12 **(14 marks)**

A factory produces pre-packed servings of udon noodles. The noodles are dispensed into packets of individual servings by a machine. However, there is variation in the serving sizes dispensed. The specifications attached to the side of the machine have been partially destroyed, so the only available information is that the mass in grams, X, of noodles dispensed is normally distributed, $P(X \leq 150) = 0.0228$ and $P(X \geq 165) = 0.1587$.

(a) Determine the mean and standard deviation of the mass of noodles dispensed by the machine. (3 marks)

The factory sells trays containing 20 packets of individual servings of udon noodles to restaurants. A standard individual serving should have a mass of at least 150 g.

(b) Determine the probability that a tray of noodles contains no underweight servings. (3 marks)

Following some customer complaints about their serving sizes, the manager of the factory decides to investigate. They select a random sample of 200 individual servings of udon noodles and determine a confidence interval for the proportion p of underweight servings to be $(0.0651, 0.1349)$.

(c) Determine the margin of error of the confidence interval. (1 mark)

(d) Determine the level of confidence that was used to calculate the confidence interval. (3 marks)

(e) On the basis of the above confidence interval, is the proportion of underweight servings of udon noodles different from what was claimed in the machine specifications? (2 marks)

(f) All else remaining equal, state how the margin of error would change if

(i) the confidence level was decreased. (1 mark)

(ii) the sample size was increased from 200 to 500. (1 mark)