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1. A manufacturer supplies DVD players to retailers in batches of 20. It has 5% of the players returned because they are faulty.

(a) Write down a suitable model for the distribution of the number of faulty DVD players in a batch. (2)

Find the probability that a batch contains

(b) no faulty DVD players, (2)

(c) more than 4 faulty DVD players. (2)

(d) Find the mean and variance of the number of faulty DVD players in a batch. (2)

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Question 2 continued

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3. A robot is programmed to build cars on a production line. The robot breaks down at random at a rate of once every 20 hours.

(a) Find the probability that it will work continuously for 5 hours without a breakdown. **(3)**

Find the probability that, in an 8 hour period,

(b) the robot will break down at least once, **(3)**

(c) there are exactly 2 breakdowns. **(2)**

In a particular 8 hour period, the robot broke down twice.

(d) Write down the probability that the robot will break down in the following 8 hour period. Give a reason for your answer. **(2)**



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Question 3 continued

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- 5. A café serves breakfast every morning. Customers arrive for breakfast at random at a rate of 1 every 6 minutes.

Find the probability that

- (a) fewer than 9 customers arrive for breakfast on a Monday morning between 10 am and 11 am. (3)

The café serves breakfast every day between 8 am and 12 noon.

- (b) Using a suitable approximation, estimate the probability that more than 50 customers arrive for breakfast next Tuesday. (6)



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- 6. (a) Define the critical region of a test statistic. (2)

A discrete random variable X has a Binomial distribution $B(30, p)$. A single observation is used to test $H_0 : p = 0.3$ against $H_1 : p \neq 0.3$

- (b) Using a 1% level of significance find the critical region of this test. You should state the probability of rejection in each tail which should be as close as possible to 0.005 (5)

- (c) Write down the actual significance level of the test. (1)

The value of the observation was found to be 15.

- (d) Comment on this finding in light of your critical region. (2)



