GRADE 12 PRELIMINARY EXAMINATION

SEPTEMBER 2019

**ADVANCED PROGRAMME MATHEMATICS: PAPER II**

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Time: 1 hour 100 Marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 4 pages and an Information Booklet of 4 pages (I – iv). Please check that your question paper is complete.
2. This question paper consists of ONE module:

**MODULE 2 (STATISTICS).**

1. Non-programmable and non-graphical calculators may be used.
2. All necessary calculations must be clearly shown and writing should be legible.
3. Diagrams have not been drawn to scale.
4. Rounding of final answers:

MODULE 2 (Statistics): FOUR decimal places unless otherwise indicated.

**MODULE 2 STATISTICS**

**QUESTION 1**

1.1 35% of the buildings in a suburb have windows with cracks in them, 15% have mould on the windows, and 55% have neither mould nor cracks.

 (a) Find the proportion of buildings that have windows with mould and cracks. (3)

 (b) Of those buildings which have windows with mould, what proportion also have cracks in the windows? (4)

1.2 A probability distribution is defined by

 $P\left(X=x\right)=\frac{μ^{x} e^{-μ}}{x!} , x=0, 1, 2, …$

 (a) Given that $P\left(X=2\right)=2∙P(X=1)$, find the value of $μ$. (5)

 (b) The number of calls received by a telephone operator has a probability distribution defined by that found in the description in 1.2. What is the probability that on any one day the operator will need to answer at least two calls. (6)

 **[18]**

**QUESTION 2**

The life of a certain make of battery is known to be normally distributed with a mean of 640 weeks and a standard deviation of 70 weeks.

2.1 Find the probability that a randomly selected battery will last at least 700 weeks. (6)

2.2 Find the maximum number of weeks for which the manufacturer can expect that not more than 5% of batteries will fail. (6)

 **[12]**

**QUESTION 3**

The quality control for the manufacturing of screws is carried out by taking a random sample of fifteen screws from a batch of 10 000. Empirical (experimental) data shows that 10% of screws are defective. If it is found that there are three or more defective screws in the sample, that particular batch is rejected.

3.1 What is the probability that the manufacturer rejects a batch? (14)

3.2 It costs the manufacturer R20,00 to process a batch of 10 000 screws. Each batch is sold for R38,00; otherwise it is sold for scrap at R5,00 per batch.

 What profit can the manufacturer expect to make on each batch? (6)

 **[20]**

**QUESTION 4**

In a batch of 50 computers 20 have a virus. If 5 computers are selected at random, what is the probability that two of them have a virus?

 **[8]**

**QUESTION 5**

A fair die is rolled 200 times. Find the probability of observing an even number on exactly 90 occasions.

 **[13]**

**QUESTION 6**

Mrs G. Neeus believes that her mathematics students are of above average intelligence. IQ scores are normally distributed. Her 30 students have a mean IQ score of 112. The mean population IQ score is 100, with a standard deviation of 15. Is there sufficient evidence to support Mrs Neeus’ claim at a 5% significance level?

 **[9]**

**QUESTION 7**

7.1 At a bakery a sample of six hand-moulded loaves of bread are taken from the normally distributed population of loaves. The population variance is known to be 4,5. The six loaves’ lengths were measured at 12,9cm; 13,2cm; 14,8cm; 12,4cm; 11,5cm and 10,2cm.

 (a) Find the 94% confidence interval for the population mean, $μ$. (6)

 (b) Explain the meaning of this confidence interval in words. (2)

7.2 A random sample of 400 Cape Vulture is tagged and then returned to the area. After some time another sample of 400 is taken and the number of tagged birds in this sample was 25.

 (a) By considering the number of tagged birds in the second sample, estimate the number of Cape Vulture in the area. (3)

 (b) Obtain a 95% confidence interval, correct to the nearest whole number, for the number of Cape Vulture in the area. (9)

 **[20]**