HARRISON COLLEGE INTERNAL EXAMINATION APRIL 2022

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION

SCHOOL BASED ASSESSMENT

PURE MATHEMATICS

UNIT II – TEST 3

Time: 1 hour and 20 minutes

NAME OF STUDENT: _____
SCHOOL CODE: 030014
DATE: _____

This examination paper consists of 11 printed pages and **1** blank page for extra working.

The paper consists of **6** questions.

The maximum mark for this examination is **60**.

INSTRUCTIONS TO CANDIDATES

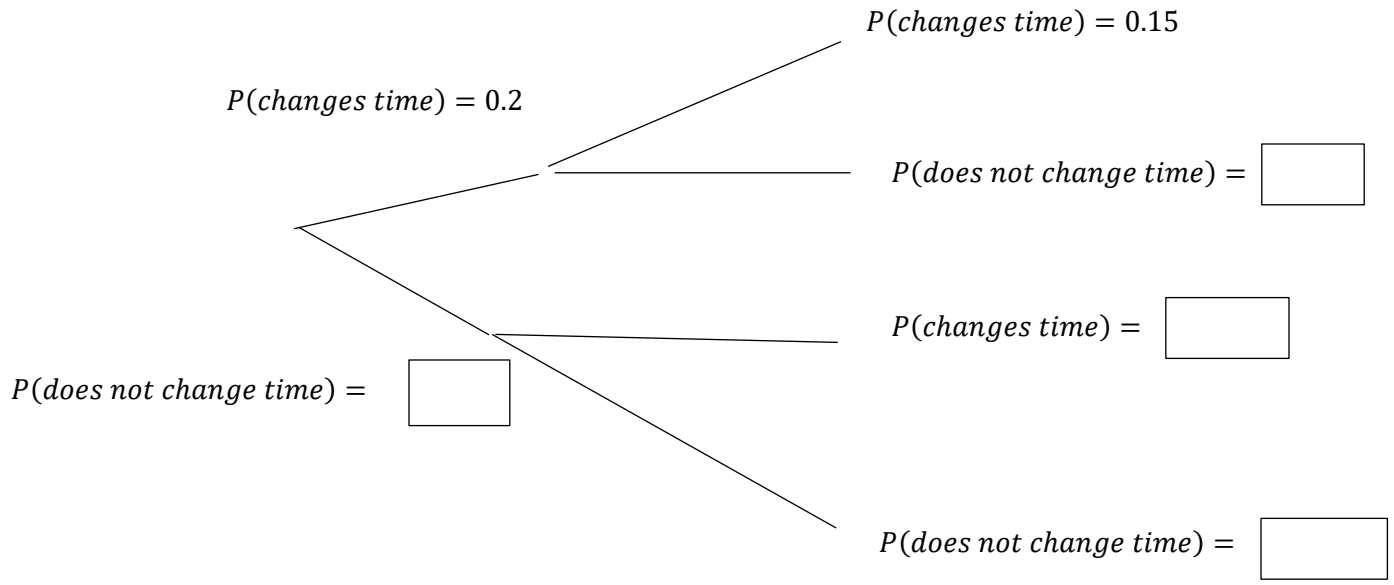
1. Write your name clearly in the space above.
2. Answer **EACH** question in the **SPACE PROVIDED**. **SHOW ALL WORKING.**
3. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided.
4. Number your questions **carefully and identically to those on the question paper**.
5. Unless otherwise stated in the question, any numerical answer that is not exact, **MUST** be written correct to three (3) significant figures

EXAMINATION MATERIALS ALLOWED

1. Mathematical formulae
2. Scientific calculator (non-programmable, non-graphical)

1) Dante has a Zoom Maths lesson once a week with Ms. Grimes. The probability that Ms. Grimes changes the time of the meeting for the next week is 0.2. If she changes the time for the meeting in the next week, the probability that she changes the time for the meeting in the following week is 0.15. If she does not change the time for the meeting next week, the probability that she does not change the time for the meeting the following week is 0.75.

a) Complete the probability tree diagram below to show all the possibilities for the next two weeks. [4]



b) Find the probability that Ms. Grimes

i) does not change the time for the next two meetings [1]

ii) changes the time for the second meeting [2]

c) It is determined that the probability that Ms, Grimes changes the time three weeks in a row is 0.003. Calculate the probability that she changes the time in the first two weeks but does not change the time in the third week. [2]

Total: 9 marks

2) a) Find the number of ways that the letters in ***MODULE TEST*** may be rearranged if

i) no restrictions apply [2]

ii) there must be an E at each end of the arrangement [2]

iii) the two Ts must be together. [2]

b) Find the probability that if the letters of ***MODULE TEST*** are rearranged randomly, the vowels will be together. (Give your answer as an exact fraction in its lowest terms) [4]

Total: 10 marks

3) The matrix $\boldsymbol{A}$ is such that $\boldsymbol{A} = \begin{pmatrix} 1 & 3 & -2 \\ 2 & 0 & 1 \\ 0 & -1 & 2 \end{pmatrix}$

i) Show that the determinant of $\boldsymbol{A}$ is -7. [3]

ii) It is known that the matrix of cofactors of $\boldsymbol{A}$ is $\begin{pmatrix} 1 & -4 & -2 \\ -4 & 2 & 1 \\ 3 & -5 & -6 \end{pmatrix}$. Find A^{-1}. [2]

iii) Hence, solve the system of equations $\begin{matrix} x + 3y - 2z = 1 \\ 2x + z = 5 \\ -y + 2z = 4 \end{matrix}$ [5]

Total: 10 marks

4) A virus hits a local school campus. The medical authorities discover that students are either sick, well or carriers of the virus. Data was collected on the number of juniors and seniors in each category. The information is shown in the table below.

Category	**Junior**	**Senior**
Well	15	25
Sick	35	40
Carrier	50	35

The student population is distributed as follows:

	Junior	**Senior**
Males	104	107
Females	80	103

a) Write the information above as two matrices $\boldsymbol{A}$ *and* $\boldsymbol{B}$ and calculate the matrix product $\boldsymbol{AB}$ which gives information on the status of the males and females on the campus. [6]

b) Determine

i) The number of sick males. [1]

ii) The number of well females. [1]

iii) The number of female carriers. [1]

Total: 9 marks

5) Find the general solution of the differential equation $\sin x \frac{dy}{dx} - y \cos x = \sin 2x \sin x$, giving your answer in the form $y = f(x)$. [8]

Total: 8 marks

6) i) Find the general solution of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 10\sin x$. [8]

ii) Find the particular solution that satisfies $y = 6\ and\ \frac{dy}{dx} = 5\ when\ x = 0.$ [6]

Total: 14 marks

End of Examination

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. ☐