

FORM TP 2017145



TEST CODE **02205032**

MAY/JUNE 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

APPLIED MATHEMATICS

MATHEMATICAL APPLICATIONS

UNIT 2 – Paper 032

1 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of THREE sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Unless otherwise stated in the question, all numerical answers MUST be given exactly OR to three significant figures as appropriate.
5. 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 at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**
7. You may use a silent, non-programmable calculator.

Examination Materials:

Mathematical formulae and tables (Revised 2012)

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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02205032/CAPE 2017

Barcode Area
Sequential Bar Code

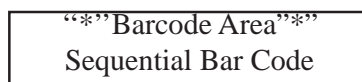
SECTION A

MODULE 1: DISCRETE MATHEMATICS

1. (a) In the space below, construct the truth table for $(p \rightarrow q) \vee \sim (p \vee \sim q)$.

[5 marks]

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- (b) Determine whether the propositions $\sim (p \wedge (\sim p \vee q))$ and $\sim p$ are logically equivalent.

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[3 marks]

- (c) Determine the truth value of EACH of the following statements:

- If $4^2 = 16$, then $4^2 + 2 = 20$.

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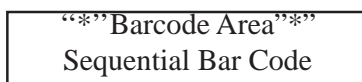
[1 mark]

- It is false that if Kingston is in Trinidad then Port of Spain is in Jamaica.

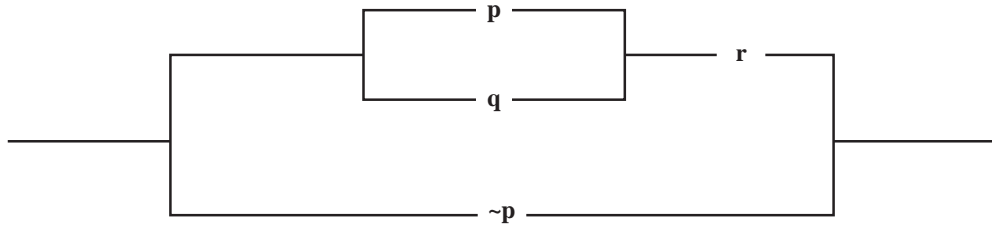
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[2 marks]

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(d) Represent the following circuit by a Boolean expression.



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[3 marks]

(e) In the space provided below, use logic gates to represent $\sim (a \vee b) \wedge b$.

[3 marks]

- (f) Simplify the Boolean expression $p \wedge ((q \wedge r) \vee (\sim p \wedge q))$.

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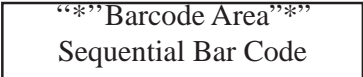
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[3 marks]

Total 20 marks

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SECTION B

MODULE 2: PROBABILITY AND DISTRIBUTIONS

2. (a) Jane has to make a number of attempts in order to connect to the Internet. The probability that she connects to the Internet is 0.35, and the attempts are assumed to be independent.

(i) State the distribution that may be used to model this information, giving its parameter(s).

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[2 marks]

(ii) Find the probability that it takes less than five attempts to connect to the Internet.

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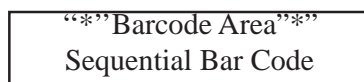
[3 marks]

(iii) Determine the expected number of attempts needed to connect to the Internet.

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[2 marks]

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- (b) Two independent random variables, X and Y , are such that $E(Y) = 1$ and $\text{Var}(Y) = 0.5$. Four probabilities of X are illustrated in the table below.

X	1	2	3	4
$P(X = x)$	0.10	0.15	0.20	0.55

Calculate

- (i) $E(X)$ and $\text{Var}(X)$

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[5 marks]

- (ii) $\text{Var}(3X - 2Y)$.

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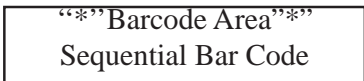
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[3 marks]

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SECTION C

MODULE 3: PARTICLE MECHANICS

[Take $g = 10 \text{ ms}^{-2}$]

3. (a) An Object A, of mass 35 kg, is at rest. An Object B, of mass 40 kg, approaches Object A at a speed of 4 ms^{-1} , then applies brakes 3 m from Object A.

- (i) If Object B stops 0.2 m before reaching Object A (that is, there is no impact), determine the required rate of deceleration of Object B.

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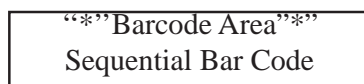
[3 marks]

- (ii) If Object B collides with Object A and stops immediately, calculate the speed of Object A just after impact.

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[3 marks]

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(b) A carriage of mass 1.2 tonnes rests on a rough track which is inclined at 30° to the horizontal. A force, P , inclined at 18° to the track and on the same plane as the carriage, causes the carriage to move up the track with constant speed.

(i) Draw a diagram to illustrate this information, showing the forces acting on the carriage.

[4 marks]

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