FORM TP 2015140

TEST CODE **02205032**

MAY/JUNE 2015

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

APPLIED MATHEMATICS

MATHEMATICAL APPLICATIONS

UNIT 2 – Paper 032

1 hours 30 minutes

12 JUNE 2015 (p.m.)

This examination paper consists of THREE sections: Discrete Mathematics, Probability and Distributions, and Particle Mechanics.

Each section consists of 1 question.
The maximum mark for each section is 20.
The maximum mark for this examination is 60.
This examination consists of 4 printed pages.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Answer ALL questions from the THREE sections.

2. Unless otherwise stated in a question, all numerical answers MUST be given exactly OR correct to three significant figures as appropriate.

Examination Materials

Mathematical formulae and tables (Revised 2010)
Electronic calculator
Ruler and graph paper

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

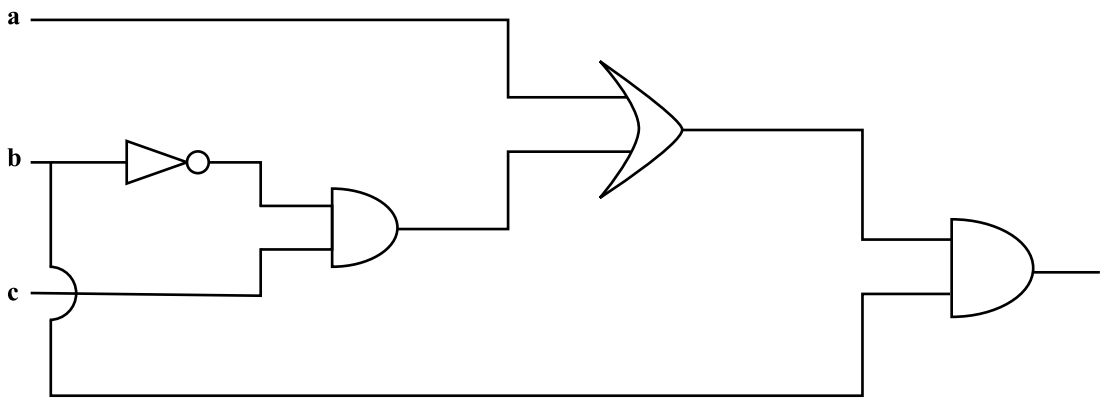
SECTION A

MODULE 1: DISCRETE MATHEMATICS

1. (a) State the converse, inverse and contrapositive of $p \Rightarrow \sim q$. **[5 marks]**

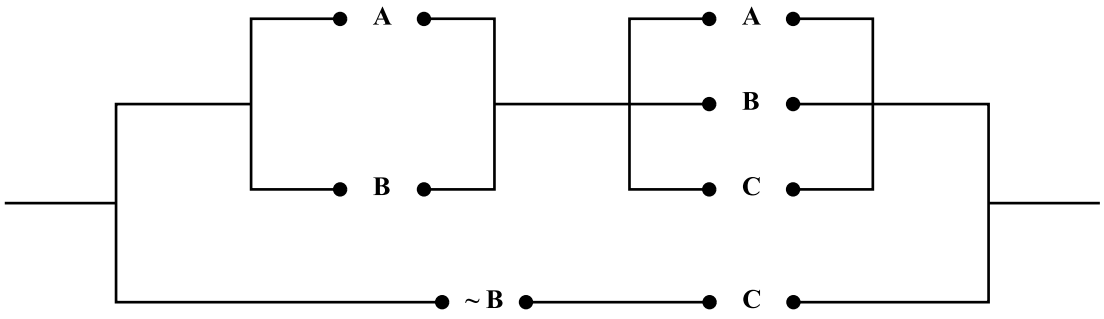
(b) Write a Boolean expression for the following circuits.

(i)



[4 marks]

(ii)



[5 marks]

(c) After a number of break-ins, a company installed an alarm system which is controlled by a switch. The alarm is triggered when the switch is on and a window or a door or both are opened. Construct a truth table to illustrate this system. **[6 marks]**

Total 20 marks

SECTION B

MODULE 2: PROBABILITY AND DISTRIBUTIONS

2. (a) A continuous random variable X has a cumulative distribution function F given by

$$F(x) = \begin{cases} 0, & x \leq 1 \\ a + bx^2, & 1 \leq x \leq 4 \\ 1, & x \geq 4 \end{cases}$$

Find the values of the constants a and b. **[5 marks]**

(b) The number of emergency calls received at a police station during a randomly chosen week may be modelled by a Poisson distribution with mean 4.5. Find the probability that AT LEAST 4 emergency calls are received during a randomly chosen two-week period. **[5 marks]**

(c) At a plant nursery, 5% of the sweet pepper trees planted bear fruits in six weeks. Twenty sweet pepper trees are planted. Calculate the probability that at most 3 will bear fruits in the six weeks. **[3 marks]**

(d) Mary has 10 friends consisting of 6 girls and 4 boys. Her mother allowed her to invite 6 of her friends to dinner. To do so, Mary chooses the 6 friends at random.

(i) Determine the number of different selections of her friends that is possible. **[2 marks]**

(ii) Find the probability that EXACTLY 3 boys are invited. **[3 marks]**

(e) Determine the number of ways of arranging the letters of the word TELEPHONE. **[2 marks]**

Total 20 marks

SECTION C

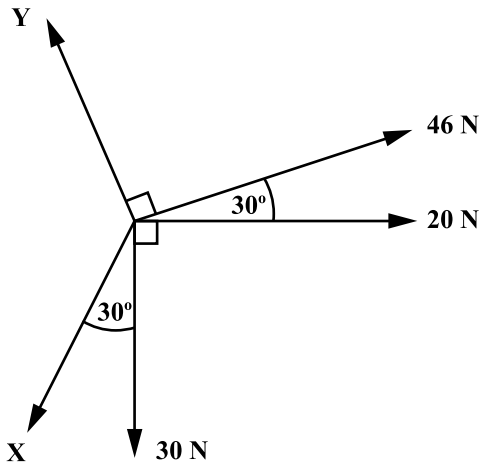
MODULE 3: PARTICLE MECHANICS

[Use $g = 10\ ms^{-2}$.]

3. (a) A particle moves in a straight line with an acceleration which is proportional to t^2, where t is the time in seconds. When $t = 2$, the particle has a velocity of 4 ms^{-1} and when $t = 4$, the particle has a velocity of 8 ms^{-1}. Find an expression for the velocity at any time, t.

[10 marks]

(b) The diagram below shows a system of five concurrent forces which are in equilibrium.



Determine the magnitude and direction of the forces **X** and **Y**. **[10 marks]**

Total 20 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.