ELITE EXAMINATION BUREAU MOCK 2019
Uganda Advanced Certificate of Education
APPLIED MATHEMATICS
PAPER 2
3 Hours

INSTRUCTIONS TO CANDIDATES

- *Answer all the **eight** questions in section **A** and five from section **B**.*
- *Any additional question(s) answered will not be marked.*
- *All working must be shown clearly.*
- *Begin each answer on a fresh sheet of paper*
- *Graph paper is provided*
- *Silent non programmable scientific calculators and tables with a list of formulae may be used.*
- *In numerical work, take g to be 9.8ms^{-2}.*

Turn Over

1. Events A and B are such that $P(A) = \frac{8}{15}$, $P(B) = \frac{1}{3}$ and $P\left(\frac{A}{B}\right) = \frac{1}{5}$. Find the

   probability that;
   i) atleast one event occurs
   ii) event B doesn't happen if event A has occurred.   (5marks)

2. A particle of mass 2.5Kg is acted upon by a force of magnitude 15N acting in the direction $2i - j - 2k$.express the acceleration of the particle in vector form.
                                                                           (5marks)

3. Show that the root of the equation $x + sinx - 1 = 0$ lies between 0.5 and 0.6. Hence use linear interpolation once to find the root correct to 2 decimal places.
                                                                           (5marks)

4. A biased coin is 3times as likely to show a head as it is to show a tail. It is tossed 7times. Find the probability that a head occurs
   i) exactly 3 times   (2marks)
   ii) atleast 4 times   (3marks)

5. Masaka is South West of Kampala. To a passage in a Kampala – Masaka bound bus, travelling at 120Kmh⁻¹, a steady wind appears to blow from the west. When the speed of the bus reduces to 90kmh⁻¹, the wind appears to the passenger to be blowing from W30°N. Find the true speed and direction of the wind.
                                                                           (5marks)

6. Use the trapezium rule with 6 ordinates to find $\int_{o}^{\frac{\pi}{4}} xsinxdx$, correct to three decimal places.   (5marks)

7. A particle projected from a point 0, at an angle of 50° above the horizontal passed through the point P, with position vector $70i + 28j$. Find the
   i)   initial velocity   (3marks)
   ii) time taken to reach P.   (2marks)

8. The probability distribution function of the discrete random variable is given by $f(x) = \beta \left(\frac{3}{4}\right)^{x}$, for x = 0, 1, 2, 3............, find the value of the constant β.
                                                                           (5marks)

SECTION B (60MARKS)
Answer any five questions from this section.

9. A continuous random variable x has the following p.d.f.

$$f(x) = \begin{cases} \lambda cosx, & 0 \leq x \leq \frac{\pi}{4} \\ \lambda sin\, x, & \frac{\pi}{4} \leq x \leq \frac{\pi}{2} \\ 0, & otherwise \end{cases}$$
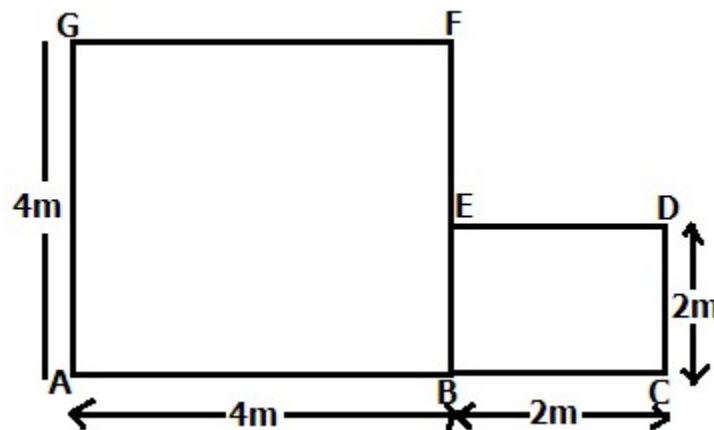
Find;
i) The value of λ. (3marks)
ii) The cumulative distribution function of x (7marks)
iii) $P(x \leq \frac{\pi}{3})$ (2marks)

10. a) the mass m and velocity Vof a car were estimated with errors Δm and Δv respectively. Show that the maximum relative error in its kinetic energy is $\left|\frac{\Delta m}{m}\right| + 2\left|\frac{\Delta V}{V}\right|$. (7marks)
    b) Find the range within which the exact value of $\frac{4.250}{4.250-2.14}$ lies (5marks)

11. A square ABCD of side 4m has forces of magnitude 8N, 3N, 3N, 4N and $2\sqrt{2}$N acting along **AB**, **CB**, **DA,CD** and **BD** respectively. Taking AB and AD as X and Y axes respectively,
    a) Find the magnitude and direction of the resultant force. (9marks)
    b) Find the distance from A where the line of action of the resultant crosses AB. (3marks)

12. An experiment consists of removing 2 sweets one at atime without replacement from a box containing 3red and 4 blue sweets.
    a) If A is the event that both sweets picked are of the same colour, find the probability that event A occurred. (4marks)
    b) If the experiment is repeated 50 times, find the probability that event A occurred
    i) between 20 and 35 times. (4marks)
    ii) atleast 25times. (4marks)

13. a) Show graphically that the root of the equation $cosx = x$ lies between 0 and 1. Hence use Newton Raphson method to find the root correct to four decimal places. (8marks)
    b) Illustrate the process in (a) above with a flow chart. (4marks)

14. A particle of mass 4kg is acted upon by a force $24t^2i + (36t - 16)j - 12tk$. If initially the particle is at a point $(3, -1, 4)$ and moving with a velocity $(16i + 15j - 8k)ms^{-1}$, determine the;
   a) speed of the particle,
   b) distance the particle covers,
   c) rate of doing work by the force, when $t = 2s$. (12marks)

15. The heights of 250 students were recorded in a survey as shown below.

Height (cm)	<175	<180	<185	<190	<195	<200
No. of students	19	55	125	189	228	250

   a) Calculate the mean height and modal height
   b) Plot a cumulative frequency curve to represent the data and use it to estimate the;
   i) Median height
   ii) Range for the central 80% of the distribution. (12marks)

16. a) particle of mass 1kg, 2kg, 3kg and 4kg lie at the points with position vectors $6i, (i - 5j), (3i + 2j)$ and $(ai + bj)$ respectively. If the centre of gravity of this system lies at the point with position vector $(2 ½ i - 2j)$, find the values of a and b. (5marks)

   b) The diagram below shows two uniform squares, ABFG and BCDE, joined together. The mass per unit area of BCDE is twice that of ABFG. Find the distance of the centre of gravity of the composite body from AB and AG. (7marks)

END