KIIRA COLLEGE BUTIKI

Uganda Advanced Certificate of Education

APPLIED MATHEMATICS

Paper 2

Lock down revision questions

In numerical work, take g to be 9.8 ms^{-2}.

SECTION A (40 MARKS)

1. Events A and B are independent such that P(A ∩ B) = ¼ and P(A ∪ B)= $^3/_4$.
   Find the P(A) and $P(B)$. *(05 marks)*

2. Given that w = 28.114, x = 7.136, y = 41.8446 and z = 3.6827, each number being rounded off to the given number of decimal places, find the percentage error in $\frac{w}{x} - \frac{y}{z}$ correct to 2 significant figures. *(05 marks)*

3. A parcel of weight 10N lies on a rough plane inclined at an angle of 30^0 to the horizontal. A horizontal force of magnitude P Newtons acts on the parcel. If the parcel is in equilibrium and on the point of slipping up the plane and the normal reaction of the plane on the parcel is 18N.Find the
   (a) value of P *(03 marks)*
   (b) co – efficient of friction between the parcel and the plane. *(02 marks)*

4. The continuous random variable X has a probability density function given by;

$$f(x) = \begin{cases} \frac{3}{4}\ (1\ +\ x^2) & ,\quad 0 \le x \le 1 \\ 0 & ,\quad otherwise \end{cases}$$

   Find P$\left(x > \frac{1}{2} / \ x > \frac{3}{4}\right)$ *(05 marks)*

5. A particles of mass 2kg is projected from a point at the bottom of a rough plane inclined at $\tan^{-1}\frac{4}{3}$, to the horizontal. If the coefficient of friction between the particle and the planes is $\frac{4}{7}$ and the particle first comes to rest at point A, calculate the distance OA. *(05 marks)*

6. Use the trapezium rule with 5 strips to evaluate $\int_0^4 e^{\sqrt{x}}\ dx$, correct to 3 decimal places. *(05 marks)*

7. The masses, to the nearest kilogram, of 200 students were recorded as in the table below.

Mass (kg)	Frequency
41 – 50	21
51 – 55	62
56 – 65	55
66 – 70	50
71 – 85	12

Draw a histogram to represent this information and use to estimate the model mass. *(05 marks)*

8. A ship P is moving due west at $12kmh^{-1}$. The velocity of a second ship Q relative to P is $15kmh^{-1}$ in a direction 30^0 west of South.
Find the velocity of ship Q. *(05 marks)*

SECTION B (60 MARKS)

9. The table below shows the distribution of random sample of marks of a group of candidate during an examination.

Marks	Frequency
$0-<10$	10
$10-<20$	25
$20-<40$	30
$40-<60$	42

$60-<70$	16
$70-<95$	15

(a) Calculate the

(i) Mean mark *(03 marks)*

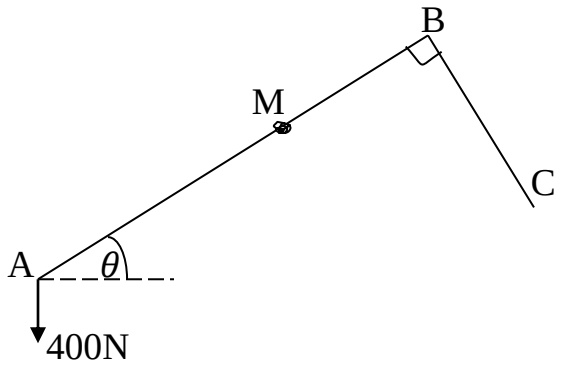
(ii) Standard deviation of the distribution. *(03 marks)*

(b) If the sample was taken from a population which is approximately normally distributed, determine the 99.5% confidence limits for the population mean mark, correct to two decimal places. *(06 marks)*

10. (a) Show that the root of the equation $f(x) = In\ x - sinx - 2 = 0$ lies between 3 and 4. *(03 marks)*

(b) By using the Newton – Raphson method, find the root of the equation in (a) above correct to 2 decimal places. *(03 marks)*

11. The diagram below shows a uniform rod AB of weight 200N and length 5m which is smoothly hinged at its midpoint to a fixed pivot M. A particle of weight 400N is attached to the rod at A.



The other end B has a light string attached which is fastened to a fixed point C. If the rod is in equilibrium with AB making an angle 0 with the horizontal where $\cos\theta = \frac{3}{4}$ and the angle ABC is 90^0. Calculate the;

(i) tension in the string. *(05 marks)*

(ii) magnitude of the resultant force exerted by the pivot on the rod *(07 marks)*

12. The table below summarises the results of the distance run by each members of an athletics club in training for a particular week.

Distance to member (km)	Number if athletics
31 – 40 41 – 45 46 – 50 51 – 55 56 – 57 58 – 60 61 – 70 71 – 90	10 15 20 70 64 24 20 10

Calculate the;

(a) mean time *(03 marks)*
(b) variance *(03 marks)*
(c) mode *(03 marks)*
(d) median *(03 marks)*

13. The information below gives a system of tax (T) calculation for the amount of money (A) earned annually by employees of a certain international company.

Annual earnings (A)	**Tax (T)**
$<$ £2000	zero
$\geq$ £2000 *but* $<$ £5000	2% of A
£5000 $\leq$ A	£60 plus 5% of the amount over £5000

(a) Draw a flow chart using the above data, given that the algorithm stops when 200 count (as) are made. *(10 marks)*

(b) Calculate the tax for an employee who earns £6000 annually. *(02 marks)*

14.(a) A particle projected from a point O on a horizontal ground moves freely under gravity and hits the ground again at A. Taking O as the origin, the equation of the path of the particle is $240y = 80x\sqrt{3} - x^2$, where x and y are measured in metres . calculate the;

(i) initial speed and angle of projection.

(ii) distance OA

(iii) (take $g = 10\text{ms}^{-2}$) *(06 marks)*

(b) A ball is kicked with a velocity of 10ms^{-1} at an angle of 40^0 to the horizontal towards a wall which is 7m away.

(i) find how far up the wall the ball hits. *(04 marks)*

(ii) calculate the speed of the ball when it hit the wall. *(02 marks)*

(iii) determine the direction the ball is moving when it hits the wall. *(02 marks)*

15.An experiment consists of removing 2 sweets one at a time without replacement from a box containing 3 red 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. *(02 marks)*

(b) If the experiment is repeated 20 times, find the probability that event A occurred

(i) between 20 and 35 times. *(03 marks)*

(ii) atleast 25 times *(04 marks)*

16.A system consists of a fixed pulley B and a movable pulley A . A light, in extensible string passes over pulley B and curves pulley A on one end and a particle of mass 6kg on the other. A second, similar string passes over pulley A and carries particles of mass 2kg and 4kg. If the pulleys are light and smooth, find the;

(a) tensions in the strings. *(07 marks)*

(b) accelerations of the three masses. *(05 marks)*