UGANDA ADVANCED CERTIFICATE OF EDUCATION
S.6 APPLIED MATHEMATICS P425/2
TIME: 3HOURS

INSTRUCTIONS

- *answer **all** the **eight** questions in **section A** and any **five** from **section B***
- *for numerical work use* $g = 9.8ms^{-2}$

SECTION B (40MARKS)

(*answer all the questions in this section*)

1. A particle decelerated uniformly from a speed of $30ms^{-1}$ for a distance of $100m$ until it attained a speed of $72kmh^{-1}$. Find the
(**i**) time taken to cover the distance (**ii**) deceleration of the particle (**5marks**)

2. The dimensions of a rectangle are 2.52m by 1.73m, rounded off to two decimal places. Find the limits within which the exact value of the area lies. (**5marks**)

3. A string of natural length l and fixed at one end, extends by $\frac{1}{4}l$ when a mass of $\frac{50}{49}kg$ hangs at its other end. Find the
(i) modulus of elasticity (ii) mass that can extend the string by $\frac{2}{5}l$. (**5marks**)

4. six students who sat for Math (x) and chemistry (y) were graded as follows

	GRADE					
x	A	B	D	E	B	C
y	C	B	A	C	E	D

Calculate the rank correlation coefficient between the two subjects. Comment on your answer. (**5marks**)

5. A particle of mass m hangs at rest from the end of a string of length a. If the particle is projected horizontally with speed u so as to move in a vertical circle, show that the tension in the string when it makes an angle θ with the downward vertical is
$T = \frac{m}{a}(u^2 - 2ga + 3gacos\theta)$. (**5marks**)

6. Given that M and N are two independent events such that $P(M) = 0.6$ and $P(M \cup N) = 0.7$, Find (i) $P(N)$ (ii) $P(\overline{M} \cup \overline{N})$ (**5marks**)

7. By applying the trapezium rule with five ordinates estimate $\int_1^2 x^2 sinx\, dx$ to three decimal places. (**5marks**)

8. A random variable X has the following distribution
$P(X = 0) = P(X = 1) = 0.15, \quad P(X = 2) = 0.3, \quad P(X = 3) = P(X = 4) = 0.2$
Find the mean and variance of X (**5marks**)

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SECTION B (60MARKS)

answer any five from this section

9. (**i**) Show that the iterative formula based on Newton Raphson for approximating the root of the equation $x = \frac{1}{\sqrt[4]{3}}$ is $x_{n+1} = \frac{x_n}{4}(5 - 3x_n^4)$, $n = 0, 1, 2 \ldots$ (**3marks**)

(**ii**) hence taking $x_0 = 0.5$ find the root correct to 3decimal places (**9marks**)

10. The table below shows the marks in percentages, got by eighty students

Marks	40—44	45—48	49—52	53—54	55—59	60—64
No. of students	15	10	14	13	13	15

a. Draw a histogram for the data and use it to find the mode (**6marks**)

b. Calculate the (i) mean (ii) standard deviation (**6marks**)

11. a. Find the coordinates for the centre of gravity of the particles of masses 2kg, 1kg, 3kg and 2kg which are spread on the $x - y$ plane at points $(6, 6), (3, 5), (7, 3),$ and $(2, -1)$ respectively. (**5marks**)

b. Find the x −coordinate for the centre of gravity of a uniform lamina lying in the first quadrant and enclosed by the curve $y = x^2 + 3$ and the lines $x = 2$ and $x = 3$ (**7marks**)

12. a. A box contains white and red cards only. The probability that a red card is picked from this box is 0.13. Two cards are selected at random from the box without replacement. Find the probability that:

(i) the second card is white,

(ii) the first one is white, given that the second is red (**6marks**)

b. The probabilities that three candidates A, B and C, pass an exam are 0.7, 0.6 and 0.8 respectively. What is the probability that:

(i) only B passes (**2marks**)

(ii) atleast one candidate passes (**2marks**)

(iii) two and only two candidates pass the exam (**2marks**)

13. Two particles A and B move with constant velocities of $(-6\boldsymbol{i} + \boldsymbol{k})\ ms^{-1}$ and $(-5\boldsymbol{i} + \boldsymbol{j} + 7\boldsymbol{k})ms^{-1}$ respectively. Initially A and B were at positions $(\boldsymbol{i} + 2\boldsymbol{j} + 3\boldsymbol{k})m$ and $(4\boldsymbol{i} - 14\boldsymbol{j} + \boldsymbol{k})m$ respectively. Find the:

a. time for which the distance between A and B is least (**8marks**)

b. shortest distance between A and B (**4marks**)

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14. A soft drink machine is regulated to discharge an average volume of $300cm^3$ per bottle. If the amount of drink is normally distributed with a standard deviation of $11cm^3$.

(a) Find the probability that a bottle selected at random has a volume of

(i) greater than $303.3cm^3$ (**3mark**s)

(ii) between $297cm^3$ and $313cm^3$ inclusive (**4mark**s)

(b) If 5 of such bottles were picked at random, find the probability that not more than 3 bottles had less than $312.1cm^3$ (**5mark**s)

15. A hammer of mass 10kg falls freely from a height of 4m and strikes without rebounding a nail of mass 2kg. The blow drives the nail a distance of 5cm into the block of wood. Find the

a. resistance of the block assumed to be uniform (**8marks**)

b. time for which the nail is in motion (**4marks**)

16. A company gives a compound interest at a rate of $R\%$ per annum on P shillings invested.

a. Write down an algorithm for the amount A accumulated after t years

b. Draw a flow chart that

(i) reads $P\ and\ R$

(ii) computes and prints A after 5years

c. Perform a dry run for the flowchart for $P = sh6{,}000{,}000,\ R = 10.$

(**12marks**)

END

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