OUR LADY OF GOOD COUNSEL S.S.S. GAYAZA
S6 HOLIDAY WORK

Uganda Advanced Certificate of Education

APPLIED MATHEMATICS

Paper two

INSTRUCTIONS TO CANDIDATES

Answer **all** *the questions in sections* **A** *and* **B**.

All*the working***must** *be shown clearly.*

Begin each question on a fresh page.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

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

Turn over

Answer **all***thequestions in this section*.

1. Two forces have magnitudes 5N and PN. If the resultant force has a magnitude 6N and acts at an angle of 40^{o} to the 5N force, find value of P. **(05 marks)**

2. Events A and B are such that P (A) = $\frac{1}{3}$, P (B) = $\frac{1}{4}$ and

P (A or B but not both A and B) = $\frac{5}{12}$. Calculate the;

(i) $P(A \cap B)$ **(02 marks)**

(ii) $P(B / A')$ **(03 marks)**

3. The radius and height of a cylinder was measured and found to be 5cm and 10cm with errors $\pm 0.2cm$ and $\pm 0.5cm$ respectively. Find the percentage error made in the calculation of volume of the cylinder. **(05 marks)**

4. A particle of mass 0.2kg and velocity 5**i** + 7**j** collides with a particle of mass 0.3kg and velocity 2**i** – 3**j**. If the particles couple together, find the;

(i) common speed **(02 marks)**

(ii) loss in kinetic energy **(03 marks)**

5. In a certain school, 40% of the students supported a candidate A for the post of Head prefect. If a random sample of 150 students is selected, find the probability that more than 55 students supported candidate A. **(05 marks)**

6. The table below shows x and the function f(x)

x	50.24	48.11	46.93	44.06
f(x)	4.116	7.621	9.043	11.163

Use linear interpolation/extrapolation to find the value of;

(i) x when f(x) is 8.614 **(03 marks)**

(ii) f(51.07) **(02 marks)**

7. A particle of mass 5kg is placed on a smooth plane inclined at $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ to the horizontal. Find the;

(i) magnitude of the force acting horizontally required to keep the particle in equilibrium **(03 marks)**

(ii) normal reaction **(02 marks)**

8. Nine voters in Kampala and Jinja were asked to give the government a score out of 100, on each of the nine issues. The results are shown below.

Issues	A	B	C	D	E	F	G	H	I
Kampala	62	54	46	34	54	46	36	29	14
Jinja	76	59	46	37	35	27	46	17	17

(i) Calculate the rank correlation coefficient between the voters in the two districts. **(04 marks)**

(ii) Comment on your result **(01 mark)**

SECTION B: (60 MARKS)

Answer **only five** *questions from this section.* **All** *questions carry equal marks.*

9. (a) An Urn contains 3 red, 4 white and 5 blue discs. If three discs are selected randomly one at a time without replacement, find the probability that the three discs are of different colours. **(05 marks)**

(b) The probability that a fisherman catches fish is 0.7 on a cloudy day and 0.2 on a clear day. If the probability of a day being clear is 0.6, find the probability that the day was cloudy given that he did not catch fish. **(07 marks)**

10. (a) Use the trapezium rule with 7 ordinates to estimate the value of $\int_{0.5}^{1} \frac{x^2}{1+x^2} dx$ correct to 4 decimal places **(06 marks)**

(b) Calculate the percentage error in using the trapezium rule to estimate the integral in (a) above correct to 2 significant figures. **(06 marks)**

11. (a) A machine cuts poles whose lengths are normally distributed with mean 4.2m and standard deviation 1.2m. If a random sample of 100 poles is selected, find the probability that a pole selected at random has its mean length

(i) in the range 4.0m to 4.3m **(04 marks)**

(ii) more than 4.1m **(03 marks)**

(b) A survey of 150 households asked how many people regularly eat bread for breakfast. The results of the survey are summarized as below;

$$\sum x = 173 \qquad \sum x^2 = 355$$

Calculate the;

(i) un biased estimate of the population variance **(02 marks)**

(ii) 97.51 confidence interval for the mean number of people who regularly eat bread for breakfast **(03 marks)**

12. (a) Show that the Newton Raphson's formula for approximating the natural logarithm of the cube root of a number N is given by $x_{n+!} = \frac{1}{3}\left(3x_n - 1 + Ne^{-3x_n}\right)$ **(06 marks)**

(b) Taking $x_o = 1$, Use your formula in (a) above to find the $In\sqrt[3]{25}$. Correct your answer to 3 decimal places. **(06 marks)**

13. At 9:00am, a fishing boat is 10km on a bearing of 110^o from a traveler, travelling with a speed of $8kmh^{-1}$ on a bearing of 060^o. If the fishing boat has a top speed of $6kmh^{-1}$, find the;

(a) route of the fishing boat if it is to be as close to the traveler as possible **(05 marks)**

(b) distance between the two boats at this point and the time at which it will occur **(07 marks)**

14. The table below shows the distribution of marks of a group of candidates 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 **(03 marks)**

(b) Draw the histogram of the data and use it to estimate the mode. **(06 marks)**

15. A continuos random variable X is defined by the p.d.f

$$f(x) = \begin{cases} k\left(x - \frac{1}{a}\right), & 0 < x < 3 \\ 0, otherwise \end{cases}$$

Give that p(x > 1) = 0.8, find the

a) Values of $a \; and \; k$ (6mrks)

b) Probability that x lies between 0.5 and 2.5 (3mrks)

c) Mean of x. (3mrks)

16. a) A pupil has 10 multiple choice questions answer. There are four alternative answers to choose from. If a pupil answers the questions randomly, find the probability

(i) that at least four answers are correct

(ii) of the most likely number of correct answers

(6mrks)

b) Otim's chances of passing physics are 0.60, of chemistry 0.75 and of mathematics 0.80.

(i) Determine the chance that he passes atleast two subjects

(ii) If it is know that he passed atleast two subjects what is the probability that he failed chemistry? (6mrks)

END