

**JINJA MODERN SECONDARY SCHOOL**  
**SENIOR FIVE END OF TERM 1 EXAMINATIONS 2024**  
**P425/2 APPLIED MATHEMATICS**

**Duration: 3 Hours**

- Attempt all questions in section A and any 5 questions in section B

**Section A**

1. The information in the table shows the amount of money in millions (A) given to some districts in Uganda for “*entandikwa*” scheme

A	25- <30	30 - <40	40 - <50	50 - <60	60 - <80
f	4	10	4	3	5

- I) Use the information to draw a histogram (03 marks)
- II) Use the histogram to estimate the mode of the distribution (02 marks)
2. The magnitude of the resultant of three forces  $(3\mathbf{i} + 6\mathbf{j})\text{N}$ ,  $(3\mathbf{i} - 2\mathbf{j})\text{N}$  and  $\lambda\mathbf{j}$  N is 10 N. Find two possible values of  $\lambda$ . (05 marks)
3. Find the range of values within which the exact value of  $2.6954 \left( 4.6006 - \frac{16.175}{0.82} \right)$  lies if the numbers are rounded off to the given number of decimal places. (05 marks)
4. When a die was thrown, the score was an even number. What is the probability that it was a prime number? (05 marks)
5. A particle traveling in a straight line with a constant acceleration covers 4.5m and 6m in the third and fourth seconds of its motion respectively. Find its acceleration and initial velocity. (05 marks)
6. Use trapezium rule with 6 ordinates to evaluate  $\int_0^1 e^{-x^2} dx$  correct to two decimal places. (05 marks)
7. Prove that for any two events A and B, (05 marks)
- $$P(A/B) + P(\bar{A}/B) = 1$$
8. A stone is thrown horizontally with speed  $u$  from the edge of a vertical cliff at height  $h$ . The stone hits the ground at a point which is a distance  $d$  horizontally from the cliff.  
 Show that  $2hu^2 = gd^2$  (05 marks)

### Section B

9. A sports car moving with uniform speed of  $80 \text{ kmh}^{-1}$  passes a police patrol car at rest. After 5 seconds, the police patrol car takes off in pursuit, accelerating uniformly at  $10 \text{ ms}^{-1}$ . Find:
- When the police patrol car catches up with the sports car. (06 marks)
  - Where the catch up takes place from the original police car station. (06 marks)

10. The table below shows the ages of 60 university students to the nearest year.

Age (years)	17 - 19	20 - 22	23 - 25	26 - 28	29 - 31
No. of students	3	7	12	25	13

- Calculate the mean and modal age of the students (06 marks)
  - Draw an ogive for the data and use it to estimate the; (06 marks)
    - Quartile deviation
    - $4^{\text{th}}$  to  $7^{\text{th}}$  decile range.
11. The distance between Kajjansi and Kampala town is 20 km. Seguuku, Zaana and Kibuye are 8 km, 12 km and 16 km respectively from Kajjansi and the taxi charges are also respectively 500/=-, 800/=-, 1000/=- and 1500/=-. Nakimboowa is going to visit her cousin Opio living 11 km from Kajjansi.
- Find how much she will be charged in this taxi (06 marks)
  - Suppose she had only 850/=- and the taxi left her at a distance worth the money, find how far from Kampala town the taxi leaves her. (06 marks)
12. Forces 3, 2, 1, 4 N act at a point along lines  $OA, OB, OC, OD$  respectively.  $\hat{AOB} = 60^\circ, \hat{BOC} = 90^\circ, \hat{COD} = 120^\circ$ . Find the magnitude of their resultant and its inclination to  $OA$ . (12 marks)

13. The table below shows the number of errors made by students at different typing speeds

Student	A	B	C	D	E	F	G	H	I	J	K	L
No. of errors, x	12	24	20	10	32	30	28	15	18	40	27	35
Speed, y	130	136	124	120	153	160	155	142	145	172	140	157

- Plot the data on a scatter diagram. (04 marks)
- Draw the line of best fit on your diagram and comment on the likely association between speed and the errors made. (02 marks)
- Determine the equation of your line in the form  $y = ax + b$  where  $a$  and  $b$  are constants. (02 marks)
- By giving rank 1 to the fastest student and a student with fewest errors, rank the above data and hence determine the rank correlation coefficient. Comment on your result. (04 marks)

14.  $X$  is a discrete random variable such that:

$$P(X = x) = \begin{cases} kx & ; x = 3, 4, 5 \\ k \cdot 2^x & ; x = 1, 2 \\ 0 & ; \text{otherwise} \end{cases}$$

a) Find the value of the constant  $k$  and hence determine;

i)  $P(X \geq 2)$  (04 marks)

ii) The variance of the distribution (04 marks)

b) Sketch the graph of  $P(X = x)$  (04 marks)

15. a) A particle is projected with a speed  $u$  at an angle of elevation  $\theta$  from  $O$  on level ground. Show that the equation of the trajectory is (06 marks)

$$y = x \tan \theta - \frac{gx^2(1 + \tan^2 \theta)}{2u^2}$$

b) A particle is projected with speed  $10\sqrt{g} \text{ ms}^{-1}$  from a point  $O$  on the ground at an elevation  $\theta$ . If the particle must clear a vertical tower of height 40 m and at a horizontal distance 40 m from  $O$ . Prove that  $2 \leq \tan \theta \leq 3$ . (06 marks)

**END**