

## S.5 APPLIED MATHEMATICS

P425/2

- In numerical work, use  $g = 9.8ms^{-2}$

### SECTION A (40 MARKS)

**Attempt all questions in this section**

1. A body moving with a velocity of  $(2i + aj)ms^{-1}$  has a speed of  $5.2ms^{-1}$ . Find the two possible values of  $a$

(05 marks)

2. The data below shows the times in minutes taken by 21 students to do a number in mechanics;

2,1,3,4,5,6,7,8,9,10,10,3,4,6,7,6,8,9,6,3,2

Represent the above data on a frequency distribution table and use it to find the;

- (i) mean time
- (ii) median time

The table below shows the ages,  $X$ , of active cases of Corona Virus Pandemic and the number of days,  $Y$ , taken by the patients to recover fully;

X	55	51	62	66	72	59	78	55	62	70
Y	34	33	39	49	48	43	51	41	46	51

- a) Calculate the rank correlation coefficient for the data.
  - b) Comment on the significance of the age on the number of days taken by the patient to recover fully at 1% level of significance.
3. A stone is thrown vertically upwards with a velocity of  $16ms^{-1}$  from a point,  $H$  meters above the ground level. The stone hits the ground 4 seconds later. Calculate the;

- a) Value of H
- b) Velocity of the stone as it hits the ground.

4. The table below shows the prices of commodities (A, B, C, D and E) in the years; 2000 and 2003;

Commodity	Price in 2000	Price in 2003
A	600	800
B	500	600
C	700	1000
D	1200	1600
E	1000	1500

Taking 2000 as the base year, calculate the simple aggregate price index for 2003 and comment on your result.

5. A curve  $y = f(x)$  passes through the points with cartesian co-ordinates  $(4, 1.88)$  and  $(5, 1.84)$ . use linear interpolation or extrapolation to estimate the value of;
- (i)  $f(4.2)$
  - (ii)  $x$  when  $f(x) = 1.795$
6. A, B and C are three points lying in that order on a straight road with  $AB = 95m$  and  $BC = 80m$ . A car is travelling along the road in the direction ABC with a constant acceleration,  $a \text{ ms}^{-2}$ . The car passes through, A with a speed,  $u \text{ ms}^{-1}$ , reaches, B five seconds later and, C two seconds after that. Find the value of  $a$  and of  $u$ .

7. The heights (*cm*) of seedlings in a nursery bed are given in the table below;

Height (cm)	3-4	5-9	10-19	20-29	30-34
Number of seedlings	2	7	16	21	9

Use a histogram to estimate the modal height of the seedlings.

## SECTION B

### Attempt all questions from this section

8. The bus stages along Soroti- Lira road are  $10\text{km}$  apart. An express Gateway bus travelling between the two towns only stops at these stages except in case of emergency when it is permitted to stop at a point in between the two stages. The fares up to the first, second, third, and fourth stages are shs.1100, shs.1500, shs.1850 and shs. 2000 respectively.
- On a certain day, Okello paid to travel from Soroti up to the fourth stage but fell sick and had to be left at the health center,  $33\text{km}$  away from Soroti. Given that he was refunded money for the part of the journey he had not travelled, find the approximate amount he received.
  - Jesca had only shs. 1650 and was allowed to board the bus but had to be left at a point worth her money. How far from Soroti was she to be left?
  - If Geoffrey was allowed to board the bus up to his home trading center stage,  $5\text{km}$  after the fourth stage, how much did he pay?
9. A train travelling along a straight track starts from rest and accelerates uniformly for  $15\text{s}$  and during this time, it travels  $135\text{m}$ . the train then maintains a constant speed for a further minute. It is then finally brought to rest, decelerating uniformly over a distance of  $90\text{m}$ .
- Calculate the train's acceleration and deceleration during the first and last stages of the journey.
  - Find the average speed of the train for the entire journey, correct to 3 significant figures
10. The table below shows the marks obtained by ten students in the three papers of physics;

Paper I	81	42	55	67	36	46	59	78	30	67
Paper II	64	50	54	70	48	32	49	54	46	58
Paper III	59	47	78	43	60	54	31	52	68	62

- a) Calculate the rank correlation coefficient between;
- Paper I and paper II
  - Paper I and paper III
- b) Comment on the significance of paper I on the students' performance in;
- Paper II,
  - Paper III, at 5% level of significance

11. A saloon car travelling at a constant velocity of  $25\text{ms}^{-1}$  overtakes a stationary police patrol car. Two seconds later after realizing that it was a stolen car, the police patrol car sets off in pursuit, accelerating at a uniform rate of  $6\text{ms}^{-2}$ .

- How far does the police patrol car travel before catching up with the saloon car?
- Calculate the velocity of the police patrol car at the time of overtake?

12. The table below shows the marks obtained by a group of holiday makers in a mathematics test;

Marks	5– < 15	15– < 25	25– < 35	35– < 45	45– < 55	55– < 65
Number of students	5	7	19	17	7	4

- Construct a cumulative frequency curve for the data
- Use your ogive in (a) above to find the;
  - Range between the  $10^{\text{th}}$  and  $70^{\text{th}}$  percentiles
  - Probability that a student selected at random scored below 50 marks

13. A particle is projected vertically upwards from the top of a building of height,  $H$  meters with a speed of  $4\text{ms}^{-1}$ . After a time of  $\left(\frac{1}{g}\right)$  seconds, another particle is projected vertically upwards from ground level at a speed of  $8\text{ms}^{-1}$ . The particles meet each other at the top of the building.

a) Show that;  $H = \frac{63}{2g}$

b) Determine the velocity of each particle just prior to collision.

14. The table below shows the percentage of sand (Y) in the soil at different soil depths (X)

X (cm)	35	65	55	25	45	75	20	90	51	60
Y (%)	86	70	84	92	79	68	96	58	86	77

- a) Plot a scatter diagram for the data and comment on the relationship between the depth of soil and the percentage of sand in the soil.
- b) Draw a line of best fit through the points of the scatter diagram in (a) above and use it to estimate the;
- Percentage of sand in the soil at the depth of 31cm
  - Depth of the soil with 54% sand

16. a) A particle with position vector of  $(40i + 10j + 20k)m$  moves with a constant speed of  $5ms^{-1}$  in the direction of the vector  $4i + 7j + 4k$ . Find the distance of the particle from the origin after 9 seconds.

- c) A locust flew  $7km$  due South and then changed its course and flew a further  $24km$ . If the locust was then  $25km$  from its original position, find the two possible directions for the course set by the locust on the second stage of its flight.

**END**

**BEST**

**WISHES**

