

P425/2

March 2020

**S.5 APPLIED MATHEMATICS, MARCH 2020 HOLIDAY PACKAGE**

**Instruction:** Practice every question for purposes of passing the forthcoming test

**Section A**

1. The resultant of the forces  $\mathbf{F}_1 = 3\mathbf{i} + (a-c)\mathbf{j}$ ,  $\mathbf{F}_2 = (2a+3c)\mathbf{i} + 5\mathbf{j}$ ,  $\mathbf{F}_3 = 4\mathbf{i} + 6\mathbf{j}$  acting on a particle is  $10\mathbf{i} + 12\mathbf{j}$ . Find the:

a) values of  $a$  and  $c$

b) magnitude of  $\mathbf{F}_2$

2. Three judges working independently ranked 6 schools in a music competition as shown in the table 1 below

	A	B	C	D	E	F
Judge 1	3	1	4	6	2	5
Judge 2	4	1	2	5	3	6
Judge 3	2	3	4	6	1	5

**Table 1**

Judge 1 is a principal judge and needs a judgment of one of the other judges. Which one should he go for and why?

3. Two cyclists **A** and **B** are 36 meters apart along a straight road. Cyclist **B** starts from rest with an acceleration of  $6\text{m/s}^2$  while **A** is in pursuit for **B** with a velocity of  $20\text{m/s}$  and an acceleration of  $4\text{m/s}^2$ . Find the:

a) times when **A** overtakes **B**

b) the distance covered by **A** to catch up with **B**

4. The data below represents the lengths of leaves in centimeters

4.4, 6.2, 9.4, 12.6, 10.0, 8.8, 3.8, and 13.6

Find the

a) mean length

b) variance

5. A vertical tower stands with its base on a horizontal ground. Two particles **A** and **B** are both projected horizontally and in the same direction from the top of the tower with initial velocities of 14.7m/s and 17.5m/s respectively. If **A** and **B** hit the ground at two points 10m apart, Find the height of the tower

6. The cumulative distribution of the weights in kg of 50 students were as follows.

Weights (kg)	<20	<30	<40	<50	<60	<70
Cumulative frequency	0	8	20	34	44	50

**Table 2**

Calculate the:

i) mean mark

ii) 60<sup>th</sup> percentile

7. A stone is projected vertically upwards with a speed of 24.54m/s from the ground level.

a) Find how long after projection the stone is at the height of 19.6m from the ground for the:

i) first time.

ii) second time

b) How long does the stone take to finally hit the ground.

8. Table 3 below shows the masses of bolts bought by a carpenter

Mass(g)	98	99	100	101	102	103	104
Number of bolts	8	11	14	20	17	6	4

**Table 3**

Calculate the;

- i) median mass
- ii) mean mass of the bolts

**Section B**

9. The time taken for 55 students to have their lunch to the nearest minutes are given below

<b>Time (minutes)</b>	3-4	5-9	10-19	20-29	30-44
<b>Number of students</b>	2	7	16	21	9

**Table 4**

- a) Calculate the mean time for the students to have lunch (5 marks)
- b) i) Draw the histogram for the given data. (5 marks)
- ii) Use your histogram to estimate the modal time for the students (2 marks)

10. A particle is initially at rest at a point on a line ABCD. The particle moves from A to B with a uniform acceleration reaching B with a speed of 12m/s after 2s. the acceleration then alters to a constant  $1\text{m/s}^2$  and 8 seconds later, after leaving B, the particle reaches C. The particle then retards uniformly to rest at point D after a further 10 seconds;

- a) Draw a velocity time graph for the motion and from it find; (2 marks)
  - i) the acceleration of the particle when travelling from A to B (3 marks)
  - ii) the speed of the particle on reaching C (2 marks)
  - iii) the retardation of the particle when travelling from C to D (2 marks)
  - iv) the total distance from A to D (3 marks)

**END**

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