CITY UNIVERSITY OF HONG KONG

Department of Mathematics

Course code & title : MA1501/GE1358 Coordinate Geometry

Session : Semester B, 2021-2022

Time Allowed : 90 minutes for writing, 20 minutes for scanning.

Instructions:

1. This is a **closed** book examination.
2. This paper has **THREE** pages (including this cover page)
3. Attempt all **EIGHT** questions in this paper.
4. **Show all steps clearly** in order to get full credits.
5. Approved calculator is permitted.

Q1. [20 marks] For the following questions:

(a) Find the coordinates of the point A which divides the interval $M(-3,-7)$, $N(-1,-4)$ externally in the ratio 8:6.

(b) Suppose P is the midpoint of MN, where M and N are (8,10) and (18,20) respectively. Further suppose that A divides MN internally and B divides MN externally in the ratio 6:9. Show that $(PA)(PB) = (MB)^2$

Q2. [10 marks] Find the point of intersection of the two lines described in the following two parametric equations. If there is no point of intersection you must still show your work.

$$(x, y, z) = (1 + 3t, 2 + 5t, 3 + 8t),\ (x, y, z) = (3 - t, 5 - 2t, 8 - 3t)$$

Q3. [10 marks] What is the shortest distance between the following two parallel lines provided

$$x + 2y = 10 \text{ and } x + 2y = 40$$

Q4. [10 marks] Given that M, N and O are $(5, 3)$, $(1, 5)$, and $(6, 6)$ respectively. Point P lies on MN, with OP perpendicular to MN. What is the coordinates of P.

Q5. [10 marks] For M is $(-4, 5)$ and N is $(0, 4)$.

(a) The coordinate of P lies on the straight line through M and N, so that the distance of MN is identical to the distance of NP. Find an equation of the straight line which passes through M and N.

(b) State the coordinates of P.

Q6. [10 marks] The points M and O are the diagonally opposite vertices of a square $MNOP$. The line l_1 has the equation: $3x - 2y = 24$. Where line l_1 meets the x and y axes at M and O respectively. The line l_2 passes through N and P. Determine the equation of l_2.

Q7. [10 marks] Given the plane $2x + y - 4z - 4 = 0$ and the line

$$x = t, y = 2 + 3t, z = t$$

Find a point of intersection.

Q8. [20 marks] For the following questions:

(a) Given the Polar Coordinates $(2, \frac{\pi}{3})$, find the Cartesian Coordinate.

(b) Given the Cartesian Coordinates $(-1, -1)$, find the Polar Coordinate.

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