RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2018-21] B.A./B.Sc. THIRD SEMESTER (July – December) 2019 Mid-Semester Examination, September 2019

Date : 18/09/19 Time : 11 am – 12 noon

MATHEMATICS (General)

Paper : III

Full Marks : 25

(4)

(4)

(4)

<u>(Use a separate Answer Book for each group)</u> <u>Group – A</u>

Answer any three questions from Question nos. 1 to 5:

1. If a plane meets the axes in A, B, C and the centroid of \triangle ABC is (α , β , γ) show that the equation of the plane is

$$\frac{x}{\alpha} + \frac{y}{\beta} + \frac{z}{\gamma} = 3.$$

- 2. Find the equation of the plane which bisects the acute angle between the planes x+2y+2z = 9and 4x-3y+12z+13 = 0.
- 3. Prove that

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$$
 and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$

are coplanar. Find also the Equation of the plane.

4. Find the shortest distance between the lines

2x+y-z=0=x-y+2zAnd x+2y-3z-4=0=2x-3y+4z-5

5. Prove that. through four non-coplanar points, one and only one sphere passes. (4)

<u>Group – B</u>

Answer any one question from Question nos. 6 & 7:

6. Two linear simultaneous equations (linearly independent) with four unknowns (variables) are given below. (2+3)

$$4x_1 + 2x_2 + 3x_3 - 8x_4 = 6$$

$$3x_1 + 5x_2 + 4x_3 - 6x_4 = 8$$

- (a) How many basic solutions are there ?
- (b) Find all of them.

7. Solve the L.P.P by simplex method

Maximize, $z = 2x_1 - 3x_2$ Subject to $-x_1 + x_2 \ge -2$ $5x_1 + 4x_2 \le 46$ $7x_1 + 2x_2 \ge 32, x_1 \ge 0, x_2 \ge 0.$

Answer any two questions from Question nos. 8 to 10:

- 8. Prove that the set of all feasible solutions to an L.P.P. $Ax = b, x \ge 0$ is a Convex set. (4)
- 9. Use the graphical method to solve the following problem

Maximize
$$z = 3x_1 + 2x_2$$

Subject to

$$\begin{array}{l} -2x_1+x_2\leq 1\\ x_1\leq 2\\ x_1+x_2\leq 3\ ,\ x_1\geq 0, x_2\geq 0. \end{array}$$

10. Use the simplex method to solve the L.P.P.

$$Maximize \quad z = 2x_2 + x_3 \tag{4}$$

Subject to

$$x_1 + x_2 - 2x_3 \le 7$$

- $3x_1 + x_2 + 2x_3 \le 3$, $x_1 \ge 0$, $x_2 \ge 0$, $x_3 \ge 0$.

(5)

(1)

(4)