RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2016-19]
B.A./B.Sc. THIRD SEMESTER (July – December) 2017
Mid-Semester Examination, September 2017

Date : 14/09/2017

MATHEMATICS (General)

Time : 12 noon – 1 pm

Paper : III

Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

(*Answer* ***any three*** *questions*) [3×4]

1. Find the foot of the perpendicular drawn from the point P(1, 8, 4) on the straight line joining the points A(0, –11, 4) and B(2, –3, 1)

2. If P be the points (2, 3, –1), then find the equation of the plane through P at right angles to the straight line OP, where O is the origin.

3. Find the shortest distance between the lines $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ and $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$; also find the equations of the line of shortest distance.

4. A sphere of constant radius d passes through the origin and intersects the Co-ordinate axes in P, Q, R. Prove that the centroid of the triangle PQR lies on the sphere $9(x^2+y^2+z^2)=4d^2$.

5. Find the equation of the right circular cone whose vertex is the origin and whose axis is the line $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and semi-vertical angle is $\frac{\pi}{3}$.

Group – B

(*Answer* ***question no. 6*** *and* ***any three*** *from the rest*)

6. Define : Convex Polyhedron. [1]

7. Prove : the set of all feasible solutions of a linear programming problem is a convex set. [4]

8. (2,1,3) is a feasible solution of the set of equations : 4x + 2y – 3z = 1 and 6x + 4y – 5z = 1. Reduce it to a basic feasible solution of the set. [4]

9. Find the dual problem of the following primal problem :
   Minimize : z = 3x – 2y
   Subject to : $2x+y\le 1$,
   $-x+3y\ge 4$,
   where $x, y\ge 0$. [4]

10. Use Penalty method to solve the following linear programming problem :
    Minimize : z = 4x + 3y
    Subject to : $x+2y\ge 8$,
    $3x+2y\ge 12$,
    where $x, y\ge 0$. [4]

11. Show that, if any one of the primal problem be a perfect equality, then the corresponding dual variable is unrestricted in sign. [4]

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