

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. MID SEMESTER EXAMINATION, SEPTEMBER 2012

SECOND YEAR

MATHEMATICS (General)

Date : 13/09/2012

Time : 11 am – 12 noon

Paper : III

Full Marks : 25

Group-A

Answer **any two** questions:

2x4

1. Show that the straight lines whose direction cosines are given by $2l+2m-n=0$ and $mn+nl+lm=0$ are at right angles. 4
2. Find the equation of the plane which passes through (2, 1, 4) and perpendicular to each of the planes $9x-7y+6z+48=0$ and $x+y-z=0$. 4
3. Find the greatest and the least distance from the point (2, -1, 3) to the sphere $x^2+y^2+z^2-2x+6y-4z-10=0$. 4

Group-B

Answer **any two** questions:

2x6

4. a) Show that the set $X = \{x: |x| \leq 2\}$ is a convex set. 2
b) (2, 1, 3) is a feasible solution of the set of equations
$$4x_1 + 2x_2 - 3x_3 = 1$$
$$6x_1 + 4x_2 - 5x_3 = 1$$
Reduce it to a basic feasible solution. 4
5. a) Prove that a hyperplane is a convex set. 3
b) Solve the following L.P.P. by graphical method:
$$\text{Minimize } z = 4x + 2y$$
$$\text{Subject to } 3x + y \geq 27$$
$$-x - y \leq -21$$
$$x + 2y \geq 30$$
and $x, y \geq 0$. 3

6. Solve the L.P.P. by simplex method:

$$\begin{aligned} &\text{Maximize } z = x_1 + x_2 + 3x_3 \\ &\text{Subject to } x_1 + 2x_2 - x_3 \leq 10 \\ &\quad 4x_1 + 3x_2 + 2x_3 \leq 8 \\ &\quad x_2 + 3x_3 \leq 15 \\ &\text{and } x_1, x_2, x_3 \geq 0. \end{aligned}$$

6

Group-C

7. Answer **any five** questions:

1x5

- a) Evaluate $(I + \Delta)(I - \nabla) f(x)$.
 - b) Show that ∇ is a linear operator.
 - c) Round-off the following numbers to four significant digits:
0.025835, 12.065025
 - d) What are the advantages of Lagrange's interpolation formula?
 - e) If 0.8333 is taken to be an approximate value of $5/6$, find the percentage error.
 - f) Write down the Newton's Backward interpolation formula for $(n+1)$ equispaced points.
 - g) Write the error term of Newton's Forward interpolation polynomial for $(n+1)$ equispaced points.
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