

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.SC. SECOND SEMESTER (January – June) 2013

Mid-Semester Examination, March 2013

Date : 07/03/2013

MATH FOR ECO (General)

Time : 12 noon – 1 pm

Paper : II

Full Marks : 25

[Answer any five questions taking atleast two from each group]

Group – A

1. Find a basis of the row space of the matrix $\begin{bmatrix} 1 & 2 & 5 \\ 3 & 0 & 7 \\ -1 & 4 & 3 \end{bmatrix}$

Examine if $(1, -1, 1)$ is in the row space.

[5]

2. Show that the matrix $\begin{bmatrix} 1 & 0 & 7 \\ 3 & 5 & 2 \\ 4 & 3 & 6 \end{bmatrix}$ is non singular and express it as a product of elementary matrices.

[5]

3. Determine the condition for which the system of equations has,

a) only one solution

b) no solution

c) many solution

where the system of equation is

$$x + y + z = b$$

$$2x + y + 3z = b + 1$$

$$5x + 2y + az = b^2$$

[5]

4. Solve the following non homogeneous system of equation and find a basis of solution space of corresponding homogeneous system of equation.

$$x + 3y + 2z = 8$$

$$2x + y + 3z = 7$$

$$5x + 10y + 9z = 31$$

[5]

Group - B

5. a) State Rolle's theorem

b) Prove that $\sin x < x < \tan x$ in $0 < x < \frac{\pi}{2}$

[1+4]

6. a) Find the value of ξ in the mean-value theorem for $f(x) = x(x-1)(x-2)$ in $0 \leq x \leq \frac{1}{2}$

b) Evaluate $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right)^{1/x}$

[2+3]

7. If $y = a \cos(\log x) + b \sin(\log x)$, prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2 + 1)y_n = 0$

[5]

8. Expand the function $f(x) = \sin x$ in powers of x in infinite series, stating in each case the condition under which the expansion is valid.

[5]