## RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR B.A./B.SC. THIRD SEMESTER (July – December) 2014 Mid-Semester Examination, September 2014

Date : 17/09/2014

#### MATH FOR ECO (General)

Time : 12 noon – 1 pm

Paper : III

Full Marks : 25

[1×2]

[3×5]

[2]

# [Use a separate answer book for each group]

# <u>Group – A</u>

- 1. Answer **any one** question :
  - a) Evaluate the improper integral  $\int_{1}^{\infty} \frac{\log x}{x^2} dx$  by  $\mu$ -test.
  - b) Find the range of values of x for which  $y = x^2 6x^3 + 12x^2 + 5x + 7$  is concave upwards or downwards. [2]
- 2. Answer **any three** questions :
  - a) Define point of inflexion of a curve y = f(x). Find the points of inflexion, if any of the curve. [1+4]
  - b) State the relation between Beta function and Gamma function. Use it to prove that  $\int_{0}^{1} x^{\frac{3}{2}} (1-x)^{\frac{3}{2}} dx = \frac{3\pi}{128}.$  [1+4]
  - c) Find the envelope of the following family of straight line  $y = mx + \sqrt{a^2m^2 + b^2}$ , parameter m. [5]
  - d) Write the definition of continuity of a function  $f: D \to \mathbb{R}(D \subseteq \mathbb{R}^2)$  at a point (a,b).

Use it to show that the function  $f(x, y) = \begin{cases} \frac{xy}{\sqrt{x^2 + y^2}} & \text{if } (x, y) \neq (0, 0) \\ 0 & \text{if } (x, y) = (0, 0) \end{cases}$  is continuous at (0,0) [2+3]

### <u>Group – B</u>

- 3. Answer <u>any two</u> questions : [2×4]
  - a) Solve an find the singular solution of the differential equation  $x^3p^2 + x^2py + a^3 = 0$ . [3+1]

b) Solve: 
$$x\left(\frac{dy}{dx}\right)^2 + (x+1)(x+y)\frac{dy}{dx} + (x+y)^2 = 0.$$
 [4]

c) Find the Particular Integral (PI) of the differential equation :  $(D^2 - 4D + 3)y = \sin 3x \cos 2x$ . [4]

d) Solve: 
$$\frac{d^2y}{dx^2} - y = x^2 \cos x$$
. [4]

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