# RAMAKRISHNA MISSION VIDYAMANDIRA

**(Residential Autonomous College under University of Calcutta)**

**SECOND YEAR**

**B.A./B.SC. FOURTH SEMESTER (January – June), 2012**

**Mid-Semester Examination, March 2012**

Date : 22/03/2012 **MATHEMATICS (General)**

Time : 2 pm – 3 pm Paper : IV Full Marks : 25

1. Answer **any two** questions. [2×3]

   a) Define Beta function. Using definition of Beta function evaluate $\int_0^{\pi/2} \cos^4 x \, dx$. [1+2]

   b) Test the convergence of $\int_0^1 \frac{dx}{(1+x)\sqrt{x}}$ by using $\mu$ - test. [3]

   c) Prove that $\int_0^\infty Y^{n-1} e^{-Ky} dy = \frac{\Gamma(n)}{K^n}$. [3]

2. Answer **any one** question. [1×4]

   a) Show that if $\ell \frac{d^2\theta}{dt^2} + g\theta = 0$ and if $\theta = \alpha$ and $\frac{d\theta}{dt} = 0$ when t = 0, then $\theta = \alpha \cos\left(t\sqrt{\frac{g}{\ell}}\right)$. Find the value of $\frac{1}{D^2 - 1} e^x$. [3+1]

   b) Solve the differential equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = \sin 2x$. [4]

3. Answer **any two** questions. [2×2]

   a) Define Conditional Probability. [2]

   b) The letters of the word 'STATISTICS' are arranged randomly. Find the probability that 3 'S' will come together. [2]

   c) Find the cumulative frequency (less than type) of the following distribution.

| | | | | | | |
|---|---|---|---|---|---|---|
| Age | : | 1 | 2 | 3 | 4 | 5 |
| Frequency | : | 3 | 5 | 2 | 6 | 3 |

   [2]

4. Answer **any one** question : [1×3]

   a) Give the classical definition of probability.

   A card has been chosen from a full pack of well shuffled 52 cards. Find the probability that the card will be a 'heart' or an 'Ace'. [1+2]

   b) Explain 'Census' and 'Sample Survey'. [1½+1½]

5. Answer **any two** questions : [2×4]

   a) For any two events A and B of a random experiment E, prove that (use venn diagram or otherwise)

   $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. [4]

   b) A picnic has been set on a particular date. According to the weather forecast there is 80% chance of rain to that date. The probability that the picnic will be good is $\frac{1}{3}$ in case of rain and $\frac{5}{6}$ in case of no rain. Find the probability that the picnic will be good. [4]

c) Construct a frequency distribution table for the following data, with class intervals, to find the frequency and cumulative frequency (both more than type and less than type) :

Class intervals : 60 – 79, 80 – 99, 100 – 119 etc.

Data : 96, 130, 63, 115, 145, 99, 118, 104, 126, 72, 77, 87, 151, 81, 142, 122, 110, 131, 98, 96 [4]

d) Draw the histogram of the following data with unequal class widths :

| Class intervals : | 0 – 10 | 10 – 15 | 15 – 20 | 20 – 24 | 24 – 35 |
|---|---|---|---|---|---|
| Frequency : | 8 | 6 | 12 | 14 | 7 |

[4]