RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [BATCH 2014-17]

B.A./B.Sc. FOURTH SEMESTER (January – June) 2016

Mid-Semester Examination, March 2016

Date : 19/03/2016 **MATHEMATICS (General)**

Time : 12 noon – 1 pm Paper : IV Full Marks : 25

1. **Answer <u>any three</u> questions :** [3×2]

   a) Evaluate, if exists, $\int_0^1 \frac{dx}{x^{2/3}}$.

   b) Evaluate, if exists, $\int_0^\infty \frac{dx}{1+x^2}$.

   c) Evaluate, if exists, $\int_0^\pi \frac{dx}{1-\cos x}$.

   d) Prove that $\int_0^\infty e^{-kx}x^{n-1}dx = \frac{(n-1)!}{k^n}$ where k > 0 and n is a positive integer.

   e) Show that $\int_0^1 x^{3/2}(1-x)^{3/2}dx = \frac{3\pi}{128}$.

2. **Answer <u>any one</u> question :** [1×4]

   a) Evaluate $\iint_R \frac{x-y}{x+y}dxdy$, where $R = \{0 \le x \le 1,\ 0 \le y \le 1\}$.

   b) Determine $\iint_R (x^2+y^2)dxdy$ where R is the region bounded by $y = x^2$, $x = 2$, $y = 1$.

3. **Answer <u>any three</u> questions :** [3×5]

   a) i) State Baye's theorem. [2]

   ii) The chance that a doctor will diagnose a certain disease correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of the doctor who had the disease dies. What is the probability that the disease was diagnosed correctly? [3]

   b) Find the value of the constant K such that

   $$f(x) = \begin{cases} Kx(1-x); 0 < x \le 1 \\ 0 \quad ; \text{elsewhere} \end{cases}$$

   is a probability density function and compute $P\left(X > \frac{1}{2}\right)$.

   c) If X is a poisson (μ)-variate and $P(X=0) = P(X=1)$, then find μ and $P(X \ge 1)$.

   d) Find the approximate number of firms with annual sales lying between Rs. 70,000 and Rs. 7,00,000, where the distribution is given below :

Annual Sales (Rs.'000) :	0 – 20	20 – 40	50 – 100	100 – 250	250 – 500	500 – 1000
No. of Firms :	18	57	69	36	28	19

   e) The expenditure of 100 families is given below

Expenditure (Rs.) :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
No. of families :	14	?	27	?	15

   Mode of the distribution is 24. Calculate the missing frequencies.

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