RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2017-20]

B.A. /B.Sc. FOURTH SEMESTER (January – June) 2019

Mid-Semester Examination, March 2019

Date : 27/03/2019

Time : 2pm – 4pm

MATH FOR INDUSTRIAL CHEMISTRY (General)

Paper: IV

Full Marks: 25

(Use a separate Answer Book <u>for each group</u>)

Group - A

1. Answer **<u>any two</u>** questions of the following: [2×5]

   a) Evaluate $\iint_R x^2y^2 dxdy$, where $R = \{(x,y): x^2+y^2 \le 1, x \ge 0, y \ge 0\}$

   b) Express $\int_0^{\frac{\pi}{2}} \sin^p\theta \cos^q\theta \, d\theta$ in terms of Beta function, mention the restriction on p,q. Also find $B\left(\frac{1}{2},\frac{1}{2}\right)$. [2+3]

   c) i) Evaluate (if exists) : $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$. [2.5]

   ii) Test for convergence : $\int_1^{\infty} \frac{dx}{\sqrt{x(1+x)}}$ [2.5]

Group - B

2. Answer **<u>any two</u>** questions of the following: [2×5]

   a) Find the cubic polynomial which takes the following values: y(1) = 24, y(3) = 120, y(5) = 336, and y(7) = 720. Hence obtain the value of y(8). [4+1]

   b) For equidistant values $x_i = x_o + ih$, h>0, i = 1, 2, 3,. . . .and $u_i = u(x_i)$, show that $e^x\left(u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + ...\right) = u_0 + u_1 x + u_2\frac{x^2}{2!} + ...$ where, Δ is the forward difference operator.

   c) From the following table, find the area bounded by the curve f(x) and the x- axis from x =7.47 to x = 7.52

<u>x</u>	<u>f(x)</u>
7.47	1.93
7.48	1.95
7.49	1.98
7.50	2.01
7.51	2.03
7.52	2.06

3. Answer any **one** question: [1×5]

a) Solve the differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$

b) Solve the differential equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 20e^{-2x}$

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