Assignment Booklet

<u>COURSE</u>

Mathematics (Hons.)

COURSE-TYPE

Core

COURSE CODE

MTMACOR01T

COURSE NAME

Calculus, Geometry and Ordinary Differential Equation

SEMESTER NUMBER: 1

DEPARTMENT OF MATHEMATICS BARASAT GOVERNMENT COLLEGE 10, K.N.C. ROAD, BARASAT KOLKATA-700124

2018-19

Dear Student,

As explained/directive by Board of Studies for Mathematics subject of WBSU, you will have one assignment for each 6 credit course. The block coverage of the assignments is indicated in the assignments itself. You are advised to read the instructions provided here before attempting the assignments.

The last date of submission of assignment is 20/11/2018 (Tuesday). You are advised not to wait for last date to submit the assignments. You have to submit the same to the H.O.D. or Course coordinators, as the case may be.

Instruction for Formatting Your Assignments

• On the top of the first page your Assignment Answer Sheet, please write the details exactly in the following format

Registration Number:	Date/Year:	Semester:
College Roll Number:	Department:	
Course Code:	Course Type:	
Course Name/Title:		
Name of Student:		
Res. Address:		
Land/Mobile Number:		

- Please follow the above format strictly to facilitate evaluation and avoid delay.
- Use only both side of foolscap size writing paper for writing your answer.
- Use separate sheet to answer different Groups (if any) in the assignments.
- Your answer should be precise.
- While solving problems clearly indicate the Group (if any), question number along with the part being solved.
- Recheck your work before submitting it.

Answer sheet received after the due date shall not be accepted. We strongly feel that you should retain a copy of your assignments to avoid any unforeseen situations.

Wishing you all good luck.

H.O.D. Department of Mathematics, Barasat Govt. College.

Mathematics Course Code: MTMACORE01T

Maximum Marks: 50 Weightage: 20%

Last Date of Submission: November, 20, 2018

Note: All questions are compulsory. Marks assigned to the questions have been shown in the bracket. Answer each group in separate sheets. This assignment is based on all area/units of MTMACORE01T.

Group A ($4 \times 5 = 20$ Marks)

- 1. Evaluate the limit: $\lim_{\theta \to \frac{\pi}{2}} \frac{2(e^{\cos \theta} + \theta 1) \pi}{\ln \sin(-3\theta)}.$
- 2. If $y = (\sinh^{-1} x)^2$, show that $(1 + x^2)y_{n+2} + (2n+1)xy_{n+1} + n^2y_n = 0$. Find also $y_n(0)$.
- 3. Let $f(x) = \frac{1}{10}x^5 + \frac{1}{6}x^{-3}$ on [1, 2]. Find the arc length.

4. Consider the semicircular arc $(x-2)^2 + (y-2)^2 = 4$, $y \ge 2$. The arc is rotated about the line y + 2x = 0. Find the area of the surface generated.

Group B (15 Marks)

- 5) a) The origin is shifted to the point (3,-1) and the axes are rotated through an angle $\tan^{-1}\frac{3}{4}$, If the coordinates of a point in new system be (5,10), find the coordinate in old system. 2
- b) If ax+by and cx+dy are changed to a'x + b'y and c'x + d'y respectively for rotation of axes, show that $\mathbf{ad} - \mathbf{bc} = a'd' - b'c'$. 3
- 6) Show that there is only one point whose coordinates do not alter due to a rigid motion (that is in translation and rotation). 5
- 7) Show that the locus of the point of intersection of a pair of perpendicular tangents to the curve $\frac{l}{r} = 1 - e \cos \theta$ is $(e^2 - 1)r^2 + 2ler \cos \theta + 2l^2 = 0$. 5

Group C (15 Marks)

8) Prove that if a family of integral curves of the linear differential equation of the first order $\frac{dy}{dx} + f(x)y = g(x)$ is cut by the line x= α , the tangents at the points of intersection are concurrent. In particular, let $f(x) - \frac{1}{x}$ and $g(x) = -\frac{1}{x^3}$. Prove for varying α the locus of the point of concurrence is a straight line. 5 5

9) Solve.
$$(2x \sin y \cos y)y' = 4x^2 + \sin^2 y$$
.

10) If
$$(x^2 + y^2)^{\alpha}$$
 be an integrating factor $(x + y)dx - (x - y)dy = 0$, find α and hence solve it. 5