# INSTITUTE OF DISTANCE AND OPEN LEARNING
## Gauhati University
## H O M E  A S S I G N M E N T
### M. A./M.Sc. Mathematics
### 2012-2013 Session ( 2nd Semester)

***Guidelines for Submission*:**

1. Write your name, session, roll number, the topic selected and the title of the answer *clearly on the top.*
2. Each of the two topics given in each paper will be answered as **two essays** of *not more than 500 words each*. There will be negative marking for writing in excess of the word-limit.
3. Each answer (essay) carries a weightage of **10 marks**. (10 marks x 2 essays = 20 marks).
4. Keep a margin of about 1 inch on each side of the page.
5. You can submit the essay written in your own hand-writing on clean, foolscap sheets, or A-4 sized paper.
6. In case you prefer to submit type-written answers, make sure that there are no typing errors which will deduct from the overall impression.
7. Do not submit commercially purchased answers as such a practice is deemed to be unfair.
8. Please submit your assignment by **30th April, 2013**.

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**201. Complex Analysis (answer any two)** 2×10=20

1. State and prove Maximum Modules theorem.
2. State and prove Laurent's theorem.
3. Find the bilinear transformation which transforms R(z) ≥ 0 into the unit circle |w| ≤ 1.

**202. Functional Analysis (answer any two)** 2×10=20

1. Define Norm linear Space. State and prove Hahn Banach Thorem.
2. State and prove spectral theorem.
3. What do you mean by adjoint of an operator in a Hilbert space.Discuss some properties of it?

**203. Hydrodynamics (answer any two)** 2×10=20

1. Define stream line, path line and streak lines. The velocity field at a point in fluid is given as $q = (x/t, y, 0)$. Obtain path lines, stream lines and streak lines.
2. Define source and sink in two dimensional motions. What arrangement of sources and sinks will give rise to the function $w = \log(z - a^2/z)$. Draw a rough sketch of the stream lines. Prove that two of the stream lines subdivide into the circle $r = a$ and axis of y.
3. What do you mean by vorticity, components of spin and vortex line? Two parallel rectilinear vortices of strengths $K_1$ and $K_2$ $(K_1 > K_2)$ are at a distance 2a apart in an infinite mass of liquid. If the vortices intersect a plane perpendicular to their length at points A and B, show that the point on AB at a distance b from the mid-point on the same side of mid-point as the vortex of strength $K_1$, is always occupied by the same fluid element if

$$\frac{K_1 - K_2}{K_1 + K_2} = \frac{b^3 - 5a^2 b}{ab^2 + 3a^3}.$$

**204. Mathematical Methods (answer any two)** 2×10=20

1. Solve the intregal equation by successive approximation

$$\phi(x) = Sinx - \frac{x}{4} + \frac{1}{4}\int_0^{\pi/2} tx\,\phi(t)\,dt$$

2. Solve the integral equation $\phi(x) = 1 + \int_a^x \phi(t)\,dt$

3. Find the Fourier integral of the function *f(x)*where

$$f(x) = \begin{matrix} 1 & |x| < 1 \\ 0 & |x| > 1 \end{matrix}$$

Hence deduce that $\int_0^{\alpha} \frac{Sin\,\theta}{\theta} d\theta = \frac{\pi}{2}$

**205. Operation Research (answer any two)** 2×10=20

1. Solve the following problem by simplex method

$Max\ Z = 4x_1 + 3x_2$

$x_1 + x_2 \leq 50$

$x_1 + 2x_2 \geq 80$

$3x_1 + 2x_2 \geq 140$

$x_1, x_2 \geq 0$

2. Define OR and discuss its scope.
3. If a finite optimal feasible solution exists for the primal, there exists a finite optimal feasible solution for the dual and conversely, the values of the two objective functions are equal.

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