



INSTITUTE OF DISTANCE AND OPEN LEARNING

Gauhati University

HOME ASSIGNMENT

M. A./M.Sc. Mathematics

(3rd Semester)

Session: 2012-2013

GUIDELINES FOR SUBMISSION OF HOME ASSIGNMENTS:

1. Write your **NAME, ROLL NUMBER, SESSION, PAPER NUMBER, TOPIC SELECTED** and **EXAMINATION**, clearly on the top of the Front page of each paper.
2. Submit your Assignments **PAPER-WISE** Separately.
3. Each Paper carries a weightage of **16 marks**.
4. Keep a margin of about 1 inch on each side of the page.
5. **Stick File** not necessary.
6. **Copying** from others including **Xerox** from others strictly prohibited.
7. You can submit the essay written in your own hand-writing on **A-4** sized paper on **One Side** of each page **Only**.
8. Submit Your Assignments strictly on or before the due date as notified. Assignments received after the due date may not be considered for evaluation.
9. The last date of submission is **25th October, 2013**.
N.B. Students are requested to follow the instructions strictly.

M301: Computer Programming in C (Answer any two)

(8 + 8) Marks

1. Write a C program that will find the roots of the quadratic equation

$$ax^2 + bx + c = 0 \text{ for all possible combinations of } a, b \text{ and } c.$$

2. Write a C program to find the greatest common divisor of two numbers.

or

1. Write a C program to evaluate the formula

$$y = x^n$$

where y and x are floating-point variables and n is an integer variable.

2. Write C program to generate the Fibonacci series 0 1 1 2 3 5.....n.

302: Number Theory (Answer any two)

(8 + 8) Marks

- i. Discuss the fundamental theorem of arithmetic.
- ii. Discuss the Wilson's Theorem and its various applications.
- iii. Discuss the Jacobi's symbol and its properties.
- iv. State and prove Chinese remainder theorem.

303: Continuum Mechanics

(Answer any one)

(16) Marks

1. What are Lagrangian and Eulerian finite strain tensors? A displacement field is given by $x_1 = X_1 + AX_2, x_2 = X_2 + AX_3, x_3 = X_3 + AX_1$. Calculate the Lagrangian and Eulerian linear strain tensors, compare them for the component, when A is small.
2. What do you mean by conservation of mass and linear momentum? Find their equations also. A continuum motion is given by $x_1 = X_1 e^t + X_3(e^t - 1), x_2 = X_2 + X_3(e^t - e^{-t}), x_3 = X_3$. Show that the Jacobian J does not vanish for this motion and obtain the velocity and acceleration components.

304: Algebra II (Optional)

(Answer any two)

(8 + 8) Marks

1. Discuss the theorems of external and internal direct product of groups.
2. State and prove Cauchy's theorem for abelian groups and Sylow's first theorem.
3. Discuss the complete ring of quotient of a commutative ring.
4. State and prove Hilbert basis theorem.

304: Space Dynamics (Optional)

(Answer any two)

(8 + 8) Marks

1. Explain the determination of orbit by geometrical method.
2. Define anomaly, eccentric anomaly, mean anomaly. Deduce Kepler's equation.
3. Write the equation of motion of a single stage rocket in vacuum.
4. Deduce the motion of satellite due to perturbation and discuss the nature of motion.

305: Special Theory of Relativity (Optional)

(Answer any one)

(16) Marks

1. Discuss inertial and non-inertial frames in relativity. Obtain the expressions of Galileo and Lorentz transformation.
2. Discuss the variation of mass with velocity in relativistic mechanics. Obtain Einstein mass and energy relation.

305: Mathematical Logic (Optional)

(Answer any two)

(8 + 8) Marks

1. Translate into symbols using quantifiers, variables and predicate symbols:
 - (i) There is a function which is continuous but not differentiable. (Using quantifiers, variables and predicate symbols)
 - (ii) If x is a rational number and y is an integer, then z is not real. (Translate into symbols and negate)
 - (iii) Some people hate every one. (Using no existential quantifiers)
 - (iv) Every number is either even or odd. (Using no universal quantifiers)
2. Prove that:
 - (i) $((\sim (p \leftrightarrow (\sim q))) \rightarrow (q \rightarrow r))$ is logically equivalent to $(q \rightarrow (p \leftrightarrow r))$.
 - (ii) $\sim ((p \rightarrow q) \rightarrow (\sim (q \rightarrow p)))$ is a tautology.
3. State the axiom scheme of K_{\neq} . State and prove Deduction theorem for the system K .
4. Define valuation of L . Prove that an extension L^* of L is consistent if and only if there is a wf which is not a theorem in L^* .

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