



INSTITUTE OF DISTANCE AND OPEN LEARNING

Gauhati University

HOME ASSIGNMENT

M. A./M.Sc. Mathematics

(3rd Semester)

Session: 2011-2012

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 8 **marks**. (8 marks x 2 essays = 16 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 **31st October, 2012**.

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) $((\sim (p \supset (\sim q))) \rightarrow (q \rightarrow r))$ is logically equivalent to $(q \rightarrow (p \supset r))$.
 - (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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