A N N A M A L A I   U N I V E R S I T Y

(Accredited with 'A⁺' Grade by NAAC)

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Annamalainagar – 608 002

Semester Pattern: 2025-26   - JANUARY SESSION

Instructions to submit First Semester Assignments

1. Following the introduction of semester pattern, it becomes **mandatory for candidates to submit assignment for each course.**

2. Assignment topics for each course will be displayed in the A.U, CDOE website (**www.audde.in**).

3. Each assignment contains 5 questions and the candidate should answer all the 5 questions. Candidates should submit assignments for each course separately. (5 Questions x 5 Marks =25 marks).

4. Answer for each assignment question should not exceed 4 pages. Use only A4 sheets and write on one side only. **Write your Enrollment number on the top right corner** of all the pages.

5. Add a template / content page and provide details regarding your Name, Enrollment number, Programme name, Code and Assignment topic. Assignments without template / content page will not be accepted.

6. Assignments should be handwritten only. Typed or printed or photocopied assignments will not be accepted.

7. **Send all First semester assignments in one envelope**. Send your assignments by Registered Post to The Director, Centre for Distance and Online Education, Annamalai University, Annamalai Nagar – 608002.

8. Write in bold letters, "ASSIGNMENTS – FIRST SEMESTER" along with PROGRAMME NAME on the top of the envelope.

9. Assignments received after the **last date with late fee** will not be evaluated.

   Date to Remember

   Last date to submit First semester assignments   : 15.04.2026
   Last date with late fee of Rs.300 (three hundred only)   : 30.04.2026

Dr. S.ARULSELVI

Director

018E1110: ABSTRACT ALGEBRA

1. a) Prove that any group of prime order is cyclic and can be
      generated by any element of the group except the identity.

   b) If H and K are finite subgroups of a group G of order $O(H)$ and $O(K)$
      respectively then prove that $O(HK) = \frac{O(H)O(K)}{O(H \cap K)}$.

2. a) State and Prove cauchy's theorem for abelian groups.

   b)   State and Prove sylow's theorem for abelian groups.

   c) Let $\varphi: G \to \bar{G}$ be a homomorphism with ker K and $\bar{N}$ be a normal

       subgroup of $\bar{G}$, where $N = \{x \in G : \varphi(x) \in \bar{N}\}$ then prove that $\frac{G}{N} \approx \frac{\bar{G}}{\bar{N}}$.

3. a) Prove that every integral domain can be imbedded in a field.

   b)   Prove that the ideal $A = (p(x))$ in $F[x]$ is a minimal ideal if and only if
        $p(x)$ is irreducibleover F.

   c) Let V is finite-dimensional and W is a subspace of V then prove that
       W is finite dimensional, $\dim W \leq \dim V$ and $\dim V/W = \dim V - \dim W$

4. a) Prove that I(G) $\approx$ G/Z , where I(G) is the group of inner
        automorphisms of G and   Z is the centre of G .

   b)   Prove that an ideal M of an Euclidean ring R is a maximal ideal if
        and only if the ideal M is the principal ideal generated by a prime
        element of R .

5. a) If F is any field, prove that the ring F(x)of all polynomials
        in x over F is a Euclidean ring.

   b)   If V and W are of dimensions m and n respectively over F then
        prove that Hom (V, W) is of dimension mn over F.

1. a) State and Prove Intermediate value theorem for Derivatives.

   b) State and Prove Chain rule for Derivatives.

2. a) Let f be of bounded variation on $[a, b]$ and V be defined on $[a, b]$ as follows $V(x) = V_f(a, x)$ if $a \leq x \leq b$ and $V(a) = 0$ then Prove that

   i. V is an increasing function on $[a, b]$.

   ii. $(V - f)$ is an increasing function on $[a, b]$.

   b) Write the Additive property of Total variation.

3. a) If $f \in R(\alpha)$ on $[a, b]$, then prove that $\alpha \in R(f)$ on $[a, b]$ and

   $\int_a^b f \, d\alpha + \int_a^b \alpha \, df = \alpha(b) f(b) - \alpha(a) f(a)$.

   b) State and Prove euler's summation formula.

4. a) State and Prove First Mean Value theorem for Riemann – Stieltges Integral.

   b) Write the necessary conditions for existence of Riemann-Stieltges Integrals.

5. a) State and Prove Tauber's theorem.

   b) State and Prove Abel's limit theorem.

<u>**018E1130: DIFFERENTIAL EQUATIONS AND APPLICATIONS**</u>

1. a) Solve $y'' + 2y' + 2y = \dfrac{e^{-x}}{\cos^3 x}$ by using the method of variation of

   parameter.

   b) Solve $y'' + 4y = 4\tan 2x$ by using the method of variation of

   parameter.

2. a) Solve the Bessel equation $x^2 y'' + xy' + (x^2 - n^2)y = 0$ in series

   taking $2n$ as non- integral.

   b) Solve the series the Legendre's equation $(1 - x^2)y'' - 2xy' + 4y = 0$

   near the singular point $x = 1$.

3. a) Find the general solution of $(x^2 - 1)y'' + (5x + y)y' + (n + 1)ny = 0$.

   b) Drive the Gauss's hyper geometric equation.

4. a) Prove that

$$\int_{-1}^{1} P_m(x)P_n(x)dx = \begin{cases} 0 & if \ m \neq n \\ \dfrac{2}{2n + 1} & if \ m = n \end{cases}$$

   b) Find the first three terms of the Legendre series $f(x) = e^x$.

5. a) Prove that

$$\int_{0}^{1} x\, J_p(\lambda_m x)\, J_p(\lambda_n x)dx = \begin{cases} 0 & if \ m \neq n \\ \dfrac{1}{2} J_{p+1}(\lambda_n)^2 & if \ m = n \end{cases}$$

   b) Prove that

$$J_p - J'_{-p} - J'_p J_{-p} = \frac{-2\sin p\pi}{\pi x}$$

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018E1140: ANALYTICAL MECHANICS

1. a) Explain the kinetic energy of a rigid body with a fixed point and angular momentum of a rigid body.
   b) Explain general motion of the spherical pendulum.

2. a) Explain the equation of motion of a particle relative to the Earth surface.
   b) Explain general motion of a top.

3. a) Explain the Lagrange's equation for any simple dynamical system.
   b) State and prove Hamilton's principle.

4. a) Explain the Angular Momentum and General Motion of a Rigid body.
   b) Discuss the motion of a simple pendulum in terms of elliptic functions and the Periodic Time of the simple pendulum

5. a) Explain the motion of a Rolling disk.
   b) Describe the Lagrange's equations for motion of a particle in a plane.