ANNAMALAI UNIVERSITY
(Accredited with 'A+' Grade by NAAC)
CENTRE FOR DISTANCE AND ONLINE EDUCATION
Annamalainagar – 608 002.

Semester Pattern: 2024-25
Instructions to submit Fourth 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 Fourth 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 – FOURTH 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 Fourth semester assignments	:	**15.04.2025**
Last date with late fee of Rs.300 (three hundred only)	:	**30.04.2025**

Dr. T. SRINIVASAN
Director

AssignmentQuestion
018E2410ComplexAnalysis-II

1. (a)Provethat $\int_0^{2\pi}\frac{d\theta}{1+a\sin\theta}=\frac{2\pi}{\sqrt{1-a^2}}\ (-1<a<1).$

   (b) Stateand proveSchwarz's theorem.

   (C)State Reflection principle and Hadamard'stheorem.

   (d)Representsinπzintheformofcanonicalproduct.

2. (a)StateandproveWeierstrasstheoremandLaurent'stheorem

   (b) Findthepolesandresiduesattheirpolesofthefollowing:

   (i) $\frac{z^2}{z^2+a^2}$,(ii) $\frac{1}{(z^2-1)^2}$

3. (a)StateandproveJensen'sformulaandPoisson-Jensenformula.

   (b) Provethattheinfiniteproduct$\prod_1^{\infty}\left(1+\frac{z}{n}\right)e^{\frac{-z}{n}}$ convergesuniformly andabsolutelyoneverycompactsubset.

4. (a)StateandproveArzela'stheorem.

   (b) Provethat,thezeros$a_1,a_2,\ldots,a_n$andpoles$b_1,b_2,\ldots,b_n$ofanelliptic functionsatisfy$a_1+a_2+\ldots+a_n\equiv b_1+b_2+\ldots b_n$(modM).

   (c) (i)Definenormalfamilyoffunctions.

   (ii)Provethat$P(z)-P(u)=-\frac{\sigma(z-u)\sigma(z+u)}{\sigma(z)^2\sigma(u)^2}$.

5. (a)ProvethatafamilyF isnormalifandonlyifitsclosure$\bar{F}$with respecttothedistancefunction$\rho(f,g)=\sum_{k=1}^{\infty}\delta_k(f,g)2^{-k}$ iscompact.

   (b) Thereexistsabasis(ω_1,ω_2)suchthattheratio$\gamma=\omega_2/\omega_1$satisfies thefollowingconditions:

   (i) Im$\gamma>0$,

   (ii) $-\frac{1}{2}<\mathrm{Re}\,\gamma<\frac{1}{2}$,

   (iii) $|\gamma|\geq 1$,

   and(*iv*)Re$\gamma>0$,*if* $|\gamma|=1$.

   Theratioγisuniquelydefinedbytheseconditions.

1.

018E2420FunctionAnalysis

1. (i)Definenormedlinearspaceand Banachspace

   (ii) StateandproveMinkowski's inequality

   (iii) ProvetheTheorems:Hahn–Banachand Open-Mapping

2. (a)Stateadprove(i)Schwartzinequality(ii)Bessel'sinequalityand Triangular inequality.

   (b) IfitisacomplexBanachs[acewhosenormobeys

   $\|x+y\|^2+\|x-y\|^2=2\|x\|^2+2\|y\|^2$and

   4(x,y)=$\|x+ y\|^2-\|x- y\|^2+i\|(x+ iy)\|^2-i\|(x- iy)\|^2$

   ProvethatBisaHilbert Space.

   (c) IfpisaprojectiononHwhichrangeMandnullspaceN,provethat M⊥N ⇔ p is self adjoint, and in this case $N=M^{\perp}$.

3. (a)IfT isnormal,thenprovethattheeigenspacesofT arepairwise orthogonal

   (b)IfB=$\{e_i\}$isabasisforH,provethatthematrixrelativetoB,isan isomorphism of the algebra β(H) onto the Matrix algebra A_n

4. (a)Showthat themapping $x\rightarrow x^{-1}$ofGinto Giscontinuousandis Therefore a homeomorphism of G onto itself.

   (b)Provethat$\|f*g\|=\|f\|\|g\|$.

5. (a)IfGisopeninaBanachAlgebra$A$thenprovethat$S$isclosed.

   (b)IfIisaproperclosedtwo-sidedidealinA, Provethatthequotient Algebra A/I is a Banach Algebra.

018E2430MathematicalStatistics

1. (a)StateandProveBorel-CanteliLemma

   (b) Ifallthecorrelationcoefficientsofzeroordersinasetofp-variates areequaltoρ,showthat

   i) Everypartialcorrelationofs-thorderis $\frac{\rho}{(1+s\rho)}$ and

   ii) The coefficient of multiple correlations R of a variate with the other(p-1) variates is given by

   $1-R^2=(1-\rho)\left[\frac{1+(p-1)\rho}{1+(p-2)\rho}\right]$.

2. (a)StateKolmogorovInequalityandproveit.

   (b) DefinerandomsamplingandAnalysisofVariance.

   (c) If$T_n$isasequenceofestimatessuchthat$E(T_n)\to\theta$and

   $Var(T_n)\to 0$asn$\to\infty$,provethat$T_n$isconsistentforθ.

3. (a)Provethat,$(n-1)S^2/\sigma^2$is$\chi^2(n-1)$.

   (b) If$(X_1,Y_1),(X_2,Y_2),\ldots,(X_n,Y_n)$,$n\geq 2$beasamplefromabivariate normalpopulation with parameters $E(X)=\mu_1$,$E(Y)=\mu_2$, $var(X)=\sigma^2_1$

   $var(Y)=\sigma^2_2$andcov(X,Y)=0.Inotherwords,let$X_1,X_2,\ldots,X_n$beiid $\mathcal{N}(\mu_1, \sigma_1^2)$random variables and $Y_1,Y_2,\ldots,Y_n$be iid $N(\mu_2, \sigma_2^2)$random Variables,andsupposethatX'sandY'sareindependent.Then prove that the pdf of R is given by $f_1(r)=$

   $$\begin{cases}\frac{\Gamma(n-1)/2}{\Gamma 1/2\Gamma n-2/2}(1-r^2)^{n-4/2} & -1\leq r\leq 1\\ 0 & \text{otherwise}\end{cases}$$

4. Thelifetimes(inhours)ofsamplesfromthreedifferentbrandsof batteries.We recorded with the following results.

Brand

X	Y	Z
40	60	60
30	40	50
50	55	70
50	65	65
50	-	75
-	-	40

Test the hypothesis that the three brands have different averageLife times.

5. (a)StateandProveNeymann-PearsonLemma

(b) FindaUMPsize α test of H_0: $\theta \leq \theta_0 \leq$ against H_1: $\theta > \theta_0$ basedona sample of n observations for the following families of pdf's

$f_\theta(x)$; $\subseteq$R,

$$f_\theta(x) = \frac{1}{\sqrt{2\pi}} e^{-(x-\theta)^2/2}; -\infty < x < \infty; -\infty < \theta < \infty;$$

018E2440-OptimizationTechniques

1. (a)Use Simplex method to solve

$$\max z = 4x_1 + 10x_2$$

Subjecttotheconstraints

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

(b) Show that,these to fall feasible solutions totheli near programming problem in convex set

2. (a)UseBig-Mmethodtosolve

$$\max z = x_1 + 2x_2 + 3x_3 - x_4$$

Subjecttotheconstraints

$$x_1 + 2x_2 + 3x_3 = 15 \quad 2x_1 +$$

$$x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

$$x_i \geq 0, \qquad i = 1 \text{ to } 4$$

(b) StateandproveGomory'sintegercuttingAlgorithm.

3. (a)UseDualSimplexmethodtosolve

$$\min z = 3x_1 + x_2$$

Subjecttotheconstraints

$$x_1 + x_2 \geq 1$$

$$2x_1 + 3x_2 \geq 2$$

$$x_1, x_2 \geq 0$$

(b) StateandproveDualitytheorem

4. (a)UseRevisedSimplexmethodtosolve

$$\max z = 3x_1 + 5x_2$$

Subjecttotheconstraints

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 18$$

(b) How to find the inverse of new basis from the proceeding basis byapplicationoftheeliminationformulasandgivetheexamples.

5. (a)SolvethefollowingTransportationproblem

				Supply
	16	20	12	200
	14	8	18	160
	26	24	16	90
Demand	180	120	150	

(b) (i)Definethreeusesofrevisedsimplexprocedure.

(ii) Statethatperturbationtechniques.

(iii) DefineDegeneracyandAnti-cyclingprocedures.

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