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

Semester Pattern: 2023-24
Instructions to submit Sixth 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 Sixth 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 – SIXTH 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 **Sixth** semester assignments : **15.04.2024**

Last date with late fee of Rs.300 (three hundred only) : **30.04.2024**

Dr. T. SRINIVASAN
Director

(S010) - B.Sc. Mathematics – III YEAR

(Sixth Semester)

010E3610 –Complex Analysis

1. (a) State and prove the Cauchy-Riemann equations and also prove that $z\bar{z}$ is nowhere analytic.

   (b) If $f(z)$ is analytic, prove that $\frac{\partial f}{\partial \bar{z}} = 0$ and also prove that $f(z)$ and $\overline{f(\bar{z})}$ are simultaneously analytic.

2. (a) Find a linear transformation that carries $2, i, -2$ into $1, i, -1$ and also discuss the transformation given by $w = z^2$.

   (b)Define conformal mapping and state the conditions under which the mapping $w = f(z)$ is conformal and find the fixed points of $w = \frac{3z-4}{z-1}$ and put it in the normal form and state its kind.

3. (a) State and prove maximum modulus principle theorem and also prove that extension Cauchy's integral theorem.

   (b) Evaluate:

$$\int_{|z|=1} |z-1|\,|dz|$$

   and also state and prove

   (i) Liouville's theorem.

   (ii) Fundamental theorem of algebra.

4. (a) State and prove the Taylor's theorem and also prove that Argument Principle theorem.

   (b) State and prove the Weirstrass theorem and also prove that Rouche's theorem.

5. (a) Evaluate:

$$\int_0^{\pi} \frac{d\theta}{a + \cos\theta}, a > 0$$

   and also prove that Jordon's lemma.

   (b) Find the poles and residues at the poles of $f(z) = \frac{e^z}{(z-a)(z-b)}$ when (i) $a \neq b$ (ii) $a = b$ and prove that Residue theorem.

010E3620 – Discrete Mathematics

1. (a) Prove that $(P \wedge Q) \rightarrow R \Leftrightarrow (P \rightarrow R) \wedge (Q \rightarrow R)$.

   (b) Prove that if n is an integer and $n^3 + 5$ is odd, then$n$ is even.

2. (a) Describe the relation R if $A = \{1,2,3,4\}$ and $B = \{1,4,6,8,9\}$ and aRb, if and only if $b = a^2$. Find the domain and range of R.

   (b) Let $A = \{a, b, c, d, e\}$ and $R = \{(a, a), (a, b), (b, c), (c, e), (c, d), (d, e)\}$. Compute R^2 and R^∞.

3. (a) Let $f: A \rightarrow B$ and $g: B \rightarrow C$ be both one-to-one and onto functions. Then prove that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.

   (b) If $f: A \rightarrow B$ and $g: B \rightarrow A$ are mappings such that $f \circ g = I_B$ and $g \circ f = I_A$ then prove that both f and g are both invertible and $f^{-1} = g$ and $g^{-1} = f$.

4. (a) Every chain is a Lattice.

   (b) If a poset has a greatest element then show that it is unique.

5. State and prove Fundamental theorem of homomorphism on semigroups.

010E3630 – Operations Research

1. Use simplex method to solve the following LPP

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

   Subject to

$$2x_1 + x_2 \leq 50$$
$$2x_1 + 5x_2 \leq 100$$
$$2x_1 + 3x_2 \leq 90$$
$$x_1, x_2 \geq 0$$

2. Solve the following Transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	40
Requirement	200	225	275	250	

3. Solve the following Assignment problem

$$\begin{array}{c|ccccc|} & 1 & 2 & 3 & 4 & 5 \\ A & 8 & 4 & 2 & 6 & 1 \\ B & 0 & 9 & 5 & 5 & 4 \\ C & 3 & 8 & 9 & 2 & 6 \\ D & 4 & 3 & 1 & 0 & 3 \\ E & 9 & 5 & 8 & 9 & 5 \end{array}$$

4. A contractor has to supply 10000 bearings per day to an automobile manufacturer. He finds that when he starts a production run, he can produce 25000 bearings per day. The cost of holding a bearing in stock for one year is Rs. 2 and the set-up cost of a production run is Rs. 1800. How frequently should production run be made?

5. The data collected in running a machine cost of which is 60000 are given below:

Year	1	2	3	4	5
Resale Value Rs.	42000	30000	20400	14400	9650
Cost of Spares Rs.	4000	4270	4880	5700	6800
Cost of Labour Rs.	14000	16000	18000	21000	25000

   Determine the optimum period for replacement of the machine.

010E3640 –Mathematical Statistics

1. (a) State and prove Baye's theorem.
(b) The contents of urns I, II and III are as follows
1 white, 2 black and 3 red balls;
2 white, 1 black and 1 red ball;
4 white, 5 black and 3 red balls
One urn is chosen at random and two balls drawn from it. They happen to be white and red. What is the probability that they come from urns I, II or III?

2. (a) Let X be a continuous random variable with p.d.f. $f(x) = \begin{cases} ax, 0 < x \le 1 \\ a,\ 1 \le x \le 2 \\ -ax + 3a, 2 \le x \le 3 \\ 0, \text{elsewhere} \end{cases}$
(i) Determine the constant $'a'$ (ii) compute $p(X \le 1.5)$
(b)Show that the random variables X and Y with joint probability density function$f(x,y)$: $\begin{cases} 12xy\,(1-y)\,; 0 < x < 1\,; 0 < y < 1 \\ 0\,; \text{otherwise} \end{cases}$ are independent.

3. (a) Let X be a random variable with the following probability distribution

X	-3	6	9
$p(x)$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Find $E(X)$ and $E(X^2)$ and using the laws of expectation, Evaluate $E(3x+1)^2$.
(b) Find the MGF of the random variable with the probability law $P(X = x) = q^{x-1}p$, $x = 1,2,3,\cdots$ Find the Mean and Variance.

4. (a) Derive the $'t'$-distribution.

(b) An insurance agent has claimed that the average age of the policy-holder who insure through him is less than the average for all the agent's which 30.5 years.

Age last Birthday:	16-20	21-25	26-30	30-35
No. of Persons:	12	22	20	30

To test his claim at 5% level of significance.

5. (a) Two random samples gave the following results

Sample	Size	Sample mean	Sum of squares of deviations from the mean
1	10	15	90
2	12	14	108

Test whether the samples come from the same normal population at 5% level of significance.
(Given $F_{0.05}(9,11) = 2.90, F_{0.05}(11,9) = 3.10$ (approx.) and $t_{0.05}(20) = 2.086, t_{0.05}(22) = 2.07$).
(b) A survey of 800 families with four children each revealed the following distribution

No. of Boys:	0	1	2	3	4
No. of Girls:	4	3	2	1	0
No. of Families:	32	178	290	236	64

In this result consistent with the hypothesis that male and female births are equally probable?