FUNCTIONAL ANALYSIS
course code:MM232
ASSIGNMENT QUESTIONS (SEMESTER 3)

1. Let $\| \ \|$ and $\| \ \|'$ be two norms on a linear space X. Then the norm $\| \ \|$ is equivalent to the norm $\| \ \|'$ if and only if there exists $\alpha, \beta > 0$ such that $\beta\| \ \|' \leq \|x\| \leq \alpha\| \ \|$ for all $x \epsilon X$.
2. Let l^2 and let l_n be defined as $l_n(k) = \begin{Bmatrix} 1 & if\ k = n \\ 0 & otherwise \end{Bmatrix}$
   Show that $l_1, l_2, l_3, l_4, \ldots$ ...is compact.
3. Show by an example that an infinite dimensional subspace of a normal space X may not be closed in X.
4. Let X ≠ 0 and y be normed space. Prove that BL(X,Y) is Banach iff Y Banach.
5. Show that any two norms on a finite dimensional linear space are equivalent.
6. Show that a Banach space cannot have a countably infinite basis.

7. Let X be a normed linear space and Y a closed subspace of X with Y ≠ X ,if $0 < r < 1$ prove that there exist $X_r \epsilon X$ such that $\|X_r\| = 1$ And $r < d(X_r, Y) \leq 1$
8. Prove that
   i) $d(ax, ay) = |a|d(x,y)$
   ii) $d(a + x, a + y) = d(x, y)$
   where d is a metric induced by on a normed space X
9. For $x \in C_\infty$, let $f(x) = \sum_{n=1}^{\infty} x(n)$ Show that f is not continuous.
10. Find the norm of the linear functional f defined by $f(x) = \int_{-1}^{0} x(t)dt - \int_{0}^{1} x(t)dt$ where $x \in [-1, 1]$
11. Show that a closed subspace of a Banach Space is Banach.
12. Show that the inverse of $F : X \to Y$ is continuous bijective linear map.

ASSIGNMENT QUESTIONS
COMPLEX ANALYSIS-l
Course Code: MM 231

1)Let D={z:|z<1} and find all mobius transformation T such that T(D)=D.

2) If T(z)=(az+b)/(cz+d), find necessary and sufficient conditions that T(Γ)=Γ, where Γ is the unit circle.

3) show that a mobius transformation T satisfies T(0)= ∞ andT(∞)=0 iffTz= az^{-1}

4)Let G be a region and let f and g be analytic functions on G such that f(z) g(z) = 0 for all z in G . Show that either f ≡ 0 or g ≡ 0

5) show that if f: G to C is analytic and γ is a rectifiable curve in G then foγ is also a rectifiable curve.

6)suppose that f: G to C is analytic and one one ; Show that f'(Z) not equal to zero for any z in G.

7) prove that an entire function has a removable singularity at infinity iff it is a constant.

OPERATIONS RESEARCH

Course code- MM 234

1) Solve the following LPP graphically

Maximize Z=$6x_1 + 5x_2$; subject to

$3x_1 + x_2 \leq 160$

$x_1 \leq 40$

$x_2 \leq 130$

$x_1 \geq 80 x_1, x_2 \geq 0$

2) Transform the following equation to the standard form

Minimize Z= $-3x_1$+4x_2-2x_3+5x_4

Subject to 4x_1-4x_2 +2x_3 $-5x_4$=-2

x_1+x_2+3x_3+5x_4 ≤ 14

$-3x_1$+4x_2-2x_3+5x_4 $\geq x_1, x_2 \geq 0$

3) Use Simplex method to solve

Maximize Z=$x_1 + 3x_2$

Subject to $x_1 \leq 5$,$x_{1+} + 2x_2 \leq 10$, $x_2 \leq 4$, $x_1, x_2 \geq 0$

Use Big M method to solve

4)Minimize Z=6$x_1 + 3x_2$+4x_3

Subject to $x_1 \geq 30$

$x_2 \leq 50$,$x_3 \geq 20, x_1 + x_2 + x_3 = 120, x_1, x_{2,} x_{3 \geq 0}$

5) Use two phase method solve

Maximize Z=$3x_1 + 4x_2$+$2x_3$

Subject to $x_1 + x_2 + x_3 + x_4 \leq 30,\ 3x_1 + 6x_2 + x_{3-}\ 2x_4 \leq 0\ , x_2 \ \geq 4$,$x_1, x_{2,}x_{3,}x_{4\geq 0,}$

6) Using north west coner method solve the TP and find its optimal solution

	M_1	M_2	M_3	M_4	Supply
W_1	2	2	2	1	3
$W2$	10	8	5	4	7
W_3	7	6	6	8	5
Demand	4	3	4	4	15

7}Find an optimal solution of the following AP

	M_1	M_1	M_1	M_1	M_1
J_1	10	11	4	2	8
J_2	7	11	10	14	12
J_3	5	6	9	12	14
J_4	13	15	11	10	7

8) Draw the projctnetwork find expected duration and variance of the job .and length of the project

.Also find the probability that to complete the project 3 days earlier than expected for the following

Job	predecessors	Optimistic time	Most probable time	Pessimistic time
A	---	2	5	8
B	A	6	9	12
C	A	5	14	17
D	B	5	8	11
E	C,D	3	6	9
F	--	3	12	21
G	E,F	1	4	7

8)Solve by the method of QP

Minimize Z= $-6x_1$+$2x_1^2$-$2x_1x_{2+}$+$2x_2^2$ subject to x_1+$x_2 \leq 2, x_1, x_2 \geq 0$

9)Determine

max $u_1^2 \ + u_2^2 + u_3^2$ subject to $u_1u_2u_3 \leq 6$

10) Minimize $u_1^2 \ + u_2^2 + u_3^2$ subject to $u_1u_2u_3 \geq 10$ $using$ forward recursion

GRAPH THEORY (ELECTIVE)-

Course code- MM233

1) Determine the automorphic groups of Pn for $n \geq 2$.

2). Show that if G is a 2-regular graph, then$\kappa(G) = \lambda(G)$.

3)Prove that a tournament T is transitive iff every two vertices of T have distinct outdegrees.

4)Prove that a graph G has an Eulerian orientation iff$G$ is Eulerian

5)Prove that a graph G contains a 1-factor iffKo$(G - S) \leq |S|$ for every proper subset S of $V(G)$.

6) Prove that every r −regular bipartite graph $(r \geq 1)$ has a perfect matching.

7)Prove that for every graph G

$\chi(G) \leq 1 + \Delta(G)$

8)Prove that for every graph G

$\chi(G) \leq 1 + \max\{\delta(H)\}$

Where the maximum is taken over all induced subgraph H of G

9)Find the radius and diameter of the Peterson graph PG. What is the centre of PG.

10) Prove that for every graph G or order n.

$\chi(G) \geq \omega(G)$.