QUAID-I-AZAM UNIVERSITY
DEPARTMENT OF MATHEMATICS
M.Phil .Admission Test Spring 2014

Time:9 0 minutes

Dated:2 2-01-2014

Note:Use separate page for each question.

Q.1. Show that the sequence (y_n), where $y_n = \frac{1}{(n+1)^2} + \frac{1}{(n+2)^2} + \frac{1}{(n+3)^2} + \ldots + \frac{1}{(n+n)^2}$ converges to zero.

Q.2. Let V be an n dimensional vector space over a field F.Show that $L(V,V) \cong M(n,F)$.

Q.3. Let $r(s)$ be a unit speed curve.Then for every s such that $\kappa(s) \neq 0$,show that the set $\{T(s), N(s), B(s)\}$ is an orthonormal set.

Q.4. Let $\mathbb{R}$ be the set of all real numbers and $\Im$ consists of $\mathbb{R}$ and all those subsets of $\mathbb{R}$ which do not contain 2.Prove or disprove that $\Im$ is a topology.

Q.5. Solve $y'' + (\cos x)y = 0$.

Q.6. Show that any two circles in the plane with the same center are Bertrand curves.

Q.7. Reduce the following into canonical form and hence solve it $u_{xx} - 2\sin x\, u_{xy} - \cos^2 x\, u_{yy} - \cos u_y = 0$.

Q.8. A particle moves in a plane with constant speed.Prove that its acceleration is perpendicular to its velocity.

Q.9. Give an example of a linear operator which is unbounded.

Q.10. Use Chebyshev method,find the root of the equation $\cos x - xe^x = 0$.

Q.11. Show that $u(x,y)$ is harmonic in some domain and find a harmonic conjugate $v(x,y)$ when $u(x,y) = \sinh x \sin y$.

Q.12. If G is a non-abelian group of order 6 then prove that $G \cong S_3$.

Q.13. Examine the convergence of $\int_1^\infty \cos x^3 dx$.

GOOD LUCK