Directorate of Distance Education
North Bengal University

PG Part II (2015-16) | Assignment | Subject: Mathematics | F.M. 100

Paper – VI, Unit – II: **5+5=10**

1. If E is a measurable set such that $O<\mu(E)<\alpha$. Then show that there is a positive set A contained in E with $\mu(A)>0$.
2. Let $\{E_n\}$ a sequence of disjoint measurable sets and for each n, let f_n be a function in $L^p\ (1\le p\le\alpha)$ which vanishes outside E_n. Let us set $f=\sum_{n=1}^{\alpha} f_n$. Then show that $f\in L^p$ if $\sum_{n=1}^{\alpha}\|f_n\|^p<\alpha$.

Paper – VI, Unit – II: **5+5 =10**

1. Let f be a functional on l_1^{α} defined by $f(x_1,x_2,x_3)=ax_1+bx_2+cx_3$. Find $\|f\|$. Also find $\|f\|$, when f is considered as a functional on l_2^3 and l_{α}^3.
2. Show that any orthonormal sequence in a Hilbert space converges weakly to zero.

Paper – VII, Unit – I: **5+5=10**

1. If u and v are harmonic, show that uv is also harmonic iff ∇u and ∇v are orthogonal.
2. Find the integral surface of $z(xp+yq)=x^2+y^2$ through the parabola $x=2, z=y^2$. Find general integral of $yzp+xzq=x+y$.

Paper – VII, Unit – II: **5+5=10**

1. Deduce Language equation of motion using D'Alembert's principle for holonomic system. Deduce Hamilton's principle using D'Alembert's principle.
2. Establish the relation between Poisson bracket and Lagrange bracket. Show that both Poisson bracket and Lagrange bracket are invariant under canonical transformation.

Paper – VIII, Unit – I: **5+5=10**

1. Show that uniform stream of velocity U can be obtained as the limit $a\to\alpha$, of the field due to a source of strength $2\pi\alpha^2U$ at $(-a,0,0)$ and a sink of strength $-2\pi a^2U$ at $(a,0,0)$.

2. Verify that $\psi = \left(\frac{A}{r^2} \cos\theta + Br^2 \right) \sin^2\theta$ is a possible form of Stokes' stream function; find the corresponding velocity potential.

Paper – VIII, Unit – II: **5+5=10**

1. By introducing ψ in the Navier-Stokes equation, show that the order of the equation can be increased by 2.
2. Define displacement thickness, momentum thickness and energy. Obtain a relation among them.

Paper – IX, Unit – I: **5+5=10**

1. Determine the equation for geodesics on the 2 dimensional space defined by $ds^2 = \left(dx^1\right)^2 + \left[\left(x^1\right)^2 + \lambda^2\right]\left(dx^2\right)^2$. λ being a constant.
2. Determine the gravitation red shift formula for the Schwarzschild space-time.

Paper – IX, Unit – II: **5+5=10**

1. Derive the Robertson-Walker line element in a homogeneous and isotropic space-time.
2. Determine the Hubble constant in the

   i) Radiation dominated and

   ii) Matter dominated era of the Einstein-de-Sitter model.

Paper – X, Unit – I: **5+5=10**

1. Solve the equation of transfer by Edingtion method.
2. Solve the equation of transfer for coherent scatting when η is a function of $\Im$.

Paper – X, Unit – II: **5+5=10**

1. Establish the relation $H(u)H(-u) = T(M) - 6$.
2. Show that the expression for $B(\Im)$ is exact.