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Eigenvalue estimates with applications to minimal surfaces. (English) Zbl 0594.58018

Pac. J. Math. 128, No. 2, 361-366 (1987).

We study eigenvalue estimates of branched Riemannian coverings of compact manifolds. We prove that if $\phi : M^n \to N^n$, is a branched Riemannian covering, and $\{\mu_i\}_{i=0}^{\infty}$ and $\{\lambda_i\}_{i=0}^{\infty}$ are the eigenvalues of the Laplace- Beltrami operator on M and N, respectively, then

$$\sum_{i=0}^{\infty} e^{-\mu_i t} \leq k \sum_{i=0}^{\infty} e^{-\lambda_i t},$$

for all positive t, where k is the number of sheets of the covering. As one application of this estimate we show that the index of a minimal oriented surface in $\mathbb{R}^3$ is bounded by a constant multiple of the total curvature. Another consequence of our estimate is that the index of a closed oriented minimal surface in a flat three- dimensional torus is bounded by a constant multiple of the degree of the Gauss map.

MSC:

58C40 Spectral theory; eigenvalue problems on manifolds
53C42 Differential geometry of immersions (minimal, prescribed curvature, tight, etc.)
58J50 Spectral problems; spectral geometry; scattering theory on manifolds

Keywords:

branched Riemannian covering; eigenvalues; Laplace-Beltrami operator; minimal surface; heat kernel

Full Text: DOI