M. Tech. (Applied Optics) Program

PH 758: Theory and Applications of Holography

Major Test: 04-05-07 ; Duration 2 hours

Answer any four questions

(1) A Continuous function $f(x)$ is band-limited. Prove that if $f(x)$ is sampled at least twice in any increment Δx as large as the spatial period of the highest spatial frequency component in $f(x)$ then $f(x)$ can be exactly reconstructed from the discrete samples (10)

(2) What are 'computer generated' holograms? List at least five applications of such holograms. Discuss the 'Binary detour-phase' method due to Brown and Lohman for generating holograms. (2 + 2 + 6)

(3) (i) What are the applications of Ultrasonic holography? List at least 3 methods of recording such holograms and describe one of the methods in detail. (1 + 1 + 3)

(ii) Explain the terms 'real-time', 'double-exposure' and 'time-average' holographic interferometry. Derive an expression for the intensity distribution in the 'time-average' holographic interferometry of a sinusoidally vibrating object. (2 + 3)

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(4) Why do we require an ever increasing storage capacity in the present times? Point out the limitations of Optical CDs and DVDs for information storage and retrieval. Describe one of the techniques of 'digital holographic data storage' and 'retrieval' in detail. (2+2+6)

(5) Write notes on any four of the followings. (10)

(i) Digital holography
(ii) X-ray holography
(iii) Color holography
(iv) Fixing of holograms in P.R. Materials
(v) Embossed holograms
(vi) Photorefractive crystals
(vii) Holographic Optical elements
(viii) Holography for Optical information processing