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Colorimetry
1) CIE RGB and XYZ color spaces, relationships; color matching functions; Y, R-Y, B-Y system and color difference signals in relation to human visual system properties; relationships between Y, R-Y, B-Y and RGB.

2) Television colorimetry; definition of transmission signals in color television (RGB, YUV, YC and complete color signal); compatibility conditions, principle of constant luminance; bandwidth of luminance and chrominance transmission signals; linear and nonlinear masking; gamma correction.

Color Reproduction
Who demonstrated the first color photography,
Describe Lippmann method
What types of screen processes do you know
Describe Technicolor proces
What is the difference between Kodachrome and Agfacolor Neu
Who was Rudolf Fischer
What is the secondary color development
What is the primary color development
What are color matching functions
Describe conditions of exact color reproduction
What is the difference between aditive and subtractive color reproduction
Describe structure of modern color negative
Describe structure of recent color print film
How is achieved reversed order of layers in positive print film
What is the reason for reversed order of layers
Describe basic principle of color development
What is the basic developing agent for color photography
How we classify color couplers
What is the process of silver bleaching
Describe processing steps of color reversal material
Describe processing steps of Kodachrome
Describe processing steps of a color negative
Why we need masking
How we create automatic mask in color negative
What is the inter-image effect and how could be used
Describe additive color printer
How works subtractive color printer
How could you eliminate reddish tone of the image with aditive printer
How could you eliminate yellow tone of the print with aditive printer
How could you eliminate magenta tone with subtractive printer
How could you eliminate blue tone of the print with subtractive pointer

Resources/Texts

Joseph S. Friedman: History of Color Photography, The American Photographic Publishing Comp., 1947

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Michale J.Langford: Advanced Photography, The Focal Press, 1972
Grant Haist: Modern Photographic Processing, John Wiley and Sons, 1979
L.F.A. Mason: Photographic Processing Chemistry, The Focal Press, 1966
R.W.G. Hunt: The Reproduction of Colour, Fountain Press, London, 1967
Dean B.Judd, Gunter Wyszecki : Color in Business, Science and Industry, John Wiley and Sons, 1975

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OPTICS

1. Light and its properties

Basic concepts of wave optics. Velocity of the light in vacuum. The refractive index of the optical materials and its dependence
on the wavelength of light. Abbe number of optical glass. Light as electromagnetic waves. Amplitude, phase, polarization,
wavelength and frequency of waves. .Plane and spherical waves. Fresnel formulae.

2. Optical imaging

The optical system. An ideal optical system. The principal and focal points and planes of the optical system. Focal length. Image
equations (conjugate distance equations). Magnification optical system. The thick and thin lens and its properties. Exact
meridional ray tracing, paraxial ray tracing. Examples of ray tracing.

3. Aberrations of optical systems

Wave and ray aberrations. Spherical aberration, coma, field curvature, astigmatism and distortion. Chromatic aberrations.
Achromatic thin doublet.

4. Photometric properties of the optical system

Aperture stop, entrance and exit pupil of the optical systems. F-number and numerical aperture of the optical systems.
Vignetting ray beams in the optical system and Field of view. Depth of focus optical system. Photometric properties of the optical
system.

5. Basic types of the camera lenses

Imaging and photometric properties of the basic types of the camera lenses. The criterion of the quality of the camera lenses
(PSF, MTF). Comparison of properties of various types of the photographic lenses. Supplementary lenses (Converters).
Methods for measuring the basic parameters and image quality of the photographic lenses (focal length, location of the focal
points, magnification, PSF, MTF).

8. Zoom lenses

Basic properties and construction of the zoom lenses. The macro-lens, their structure and properties. Image-space (or imageside)
telecentric lenses. Image stabilizer and autofocus systems.

9. The quality of the photographic lenses evaluation

Measurement of the focal length and the position of focal points of the optical systems. Measurement of lens distortions.
Measurement resolution of the optical systems, point spread function, modulation transfer function and spectral properties of
lenses. Measurement stability of the image position of the zoom lenses.

10. Interference of light
Coherence of light. Two-beam interference of light. Young interference experiment. Interference in thin dielectric layers.
Antireflection coatings, principle and their effect on reducing stray light, contrast and color matching lenses. Interference filters
and their properties.

11. Diffraction of light
What is diffraction of light. Diffraction of light by a circular and a rectangular hole. Influence of diffraction on the optical imaging
quality. Point spread function (PSF) of the optical system. Airy disc and its size. Rayleigh criterion. Resolution of the optical
systems. Modulation transfer function of the optical system (MTF) and its importance in the theory of optical imaging.

12. Holography
Physical principle of holography.

References
[1] S.F.Ray: Applied photographic optics, Focal Press, New York, 2002.
[2] http://www.cambridgeincolour.com/tutorials/camera-lenses.htm
[3] http://diglloyd.com/index-free.html
[4] http://toothwalker.org/sitemap.html
[5] http://www.hasselbladhistorical.eu/HW/HWLds.aspx
[6] http://www.trioptics.com
[7] http://en.wikipedia.org/wiki/
[8] http://www.edmundoptics.com/
[9] http://www.canon.com/bctv/faq/if.html
[10] http://www.canon.hu/Images/Ef%20Lens%20Technology_tcm128-783488.pdf

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The visual effects for film and TV - doc.Mgr. A.Weiser

TEST QUESTIONS EXAMINATION IN MASTER - FILM AND TELEVISION CAMERAMAN

1.Preparation film project containing trick shots.
(select an example project).

2.Principles cameraman work at making shots for digital composition.
On set supervision. (Detailed description)

3.Using Motion control system for filming. (options, conditions.)

4.The Color correction. (options, basic software tools used).

5.**The Digital keying.**
(conditions in the studio, background and foreground lighting, size shots, fix shot tracking shot, moving object).

6.The Digital compositing. (used software, list the basic tools for digital composition.)

7.Motion tracking – tracking point.
(explanation of the term and its application in digital post-production)

Questions for technical exams
Subject: Film laboratory

1 Packaging of film stock, storage, marking on the film and orientation on the film strip?

2 Duplication process. Basic condition of duplication process. What kinds of duplication process do you know and what is it used for?

3 Describe the process of preparing a negative for scanning and what is created and what disappears during this operation?

4 What is the basic macro sensitometry quantities? Why can't negative and positive film be combined?

5 What desaturation processes do you know, their principle? What do they affect in the negative and what in the positive?

6 Which perforations of cinematographic film do you know? Where are they used and describe their differences. What is a difference between a punch number and a keycode? Describe what these values mean and their basic characteristics.

7 Describe what is a Push and what is a Pull process. What is it used for and how is this process done?

8 Describe the process of format blow-up and reduction. What is the principle when increasing and when reducing?

9 What do you know about the names of the film reels? Describe their composition and their meaning?

10 Describe the process of converting an image from a color negative to a black-and-white version and then combining it back with the color negative. What is the processing condition here? Compare the gamma product created only in color processing with the gamma product of conversion through black and white product.

B&W process

- Ɣorig negative = 0,65
- Ɣpositive = 2,2
- Ɣdup negative = 0,6
- Ɣdup positive = 1,6

Color process

- $\Upsilon_{\text{orig negative}} = 0{,}53$
- $\Upsilon_{\text{positive}} = 3{,}2$
- $\Upsilon_{\text{dup negative}} = 0{,}99$
- $\Upsilon_{\text{dup positive}} = 0{,}99$

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Sensitometry and Exponometry

What is the difference between intensity and time scale sensitometers?
What influences the shape of the sensitometric curve?
How distribution and size of the grains decide about properties of the film material?
How is defined gradient of the sensitometric curve?
What are the basic compounds in the developing bath?
What does the fixing bath?
How is defined the speed point?
What is the difference between ASA and DIN scale?

How is defined the optical density?
When measuring primary densities what do you measure?
How differ difuse and specular densities?
How are defined integral densities of color materials?

How we can evaluate the grainy structure of the film material?
How do you measure subjective graineness?
What does it mean confused magnification ?
How do you measure rms granularity?
Define Selwyn´s law.
How is defined resolving power?
What is it acutance?
What is it modulation transfer function?