Reg. No.										

MANIPAL UNIVERSITY

FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2007

SUBJECT: GENERAL ANATOMY AND OCULAR ANATOMY

Monday, August 27, 2007

Time: 3 Hrs. Max. Marks: 80

Answer all the questions. Draw diagrams wherever necessary.

1. Describe the vascular coat of the eyeball in detail.

(12 marks)

2. Write short notes on:

2A. Pituitary gland

2B. Uterus

2C. Right atrium

(6×3 = 18 marks)

3. Write notes on:

3A. Mediastinal surface of right lung

3B. Structure of thin skin

3C. Spinal cord

(5×3 = 15 marks)

4. Write briefly on:

4A. Cerebro spinal fluid

4B. Duodenum

4C. Spleen

4D. Iris

4E. Structure of eyelid

(4×5 = 20 marks)

5. Write briefly on:

5A. Sinus venosus sclerae

5B. Ureter

5C. Middle meatus of the nose

5D. Optic radiation

5E. Ovary

(3×5 = 15 marks)

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MANIPAL UNIVERSITY

FIRST YEAR B. Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2007

SUBJECT: PHYSICAL OPTICS

Thursday, August 30, 2007

Time: 3 Hrs. Max. Marks: 80

Physical constants

Speed of light (C)	$= 3\times10^{8}$ m/s
Electron charge (e)	$= 1.6\times10^{-19}$C
Electron mass (m)	$= 9.11\times10^{-31}$Kg
Planck's constant (h)	$= 6.63\times10^{-34}$ Js
Boltzmann's Constant (k)	$= 1.38\times10^{-23}$ J/K
Permittivity of vacuum (ε_0)	$= 8.85\times10^{-12}$ F/m

1. Explain with reasons whether the following statements (**ANY TEN**) are true or false.

1A. The fringe width in the double slit interference pattern will decrease with increasing wavelength of the incident light.

1B. The real source and its image formed by Lloyd's single mirror will serve as two coherent sources.

1C. In costume jewelry coating technique is used to enhance reflection.

1D. In a Michelson's interferometer, when the moveable mirror is moved by a distance d the resultant path difference changes by d/2.

1E. In phase reversal zone plates the alternate zones are coated suitably to make the image sharper.

1F. Diffraction of light waves of longer wavelength is more pronounced.

1G. In Newton's ring experiment when the air film is replaced by any other film the rings will expand in size.

1H. Polarization reduces the intensity of the incident light.

1I. Photometers work on the basis of Lambert's cosine law of radiation.

1J. Dispersive power of a grating increases with increasing order of the spectrum.

1K. Mie scattering makes the clouds appear white.

1L. Rayleigh scattering is the result of absorption from the minute particles in the atmosphere.

(2×10 = 20 marks)

2. Answer any **SIX** of the following:

2A. Assuming the formula used, briefly describe how the wavelength of a monochromatic source of light is condition determined by setting up Newton's ring experiment.

2B. Derive an expression for the fringe width of the interference pattern formed by a wedge shaped film. Mention its applications.

2C. Obtain an expression for the radius of the n^{th} half period zone and hence show that the area of any half period zone is approximately same.

2D. Describe the construction and working of a Michelson interferometer.

2E. State Rayleigh's criterion for the resolution of two closely spaced lines. Obtain expressions for the resolving power and the dispersive power of a grating.

2F. Obtain an expression for the intensity of the diffraction pattern for a single slit as a function of the diffraction angle. Indicate the position of maxima and minima.

2G. Explain briefly how a photometer may be used to determine the transmission coefficient of a transparent sheet.

2H. Derive an expression for the fringe width of the interference pattern from double slit interference.

(6×6 = 36 marks)

3. Answer any **SIX** of the following:

3A. Two straight and narrow parallel slits 1 mm apart are illuminated by monochromatic light. Fringes formed on the screen held at a distance of 100cm from the slits are 0.50 mm apart. What is the wavelength of the light?

3B. A bi-prism is placed at a distance of 5cm in front of a narrow slit illuminated by light of wavelength 589nm. The distance between the virtual sources is found to be 0.05cm. Find the fringe width at a distance of 75 cm from the bi-prism.

3C. A glass wedge of angle 0.01 radian is illuminated by monochromatic light of wavelength 600 nm normally. At what distance from the edge of the wedge will the tenth fringe be observed in reflected light?

3D. If the planes of vibration of the incident beam makes an angle of 30° with the optic aixs, compare the intensities of the extraordinary and the ordinary light.

3E. The two headlights of an approaching automobile are 1.42m apart. At what angular separation will the eye with a pupil diameter 5.00mm resolve them? Assume the wavelength of light to be 562nm.

3F. Rayleigh scattering causes 1.85% of 1.06μm radiation to be lost when passing through 10km atmosphere. What is the percentage loss of radiation of 694.3nm?

3G. What is the minimum thickness of a calcite crystal that will function as a quarter wave plate for a wavelength of 589nm? Given that the refractive indices of the crystal for the ordinary and the extraordinary rays are 1.658 and 1.486 respectively.

3H. A diffraction grating 21.5 mm wide has 6140 rulings. At what smallest angle will maximum intensity beam occur if the incident radiation has a wavelength of 589 nm?

(4×6 = 24 marks)

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MANIPAL UNIVERSITY

FIRST YEAR B.Sc. OPTOMETRY DEGREE EXAMINATION – AUGUST 2007

SUBJECT: GEOMETRICAL OPTICS

Friday, August 31, 2007

Time: 3 Hrs. Max. Marks: 80

✍ **Write legibly. Write the question numbers in the margin.**

Physical constants:

Velocity of light in vacuum=$3\times10^{8}ms^{-1}$

Boltzmann constant = $1.38\times10^{-23}JK^{-1}$

Electron mass = $9.1\times10^{-31}kg$

Electron charge =$1.6\times10^{-19}C$

Planck constant = $6.63\times10^{-34}Js$.

1. State whether the following statements are 'True' or 'Flase'. Briefly explain / justify your answer for any '**TEN**'.

1A. Rays are tangential to wavefronts.

1B. When light reflects from a surface, the beam width changes.

1C. Looking from water objects in air appear farther away from the surface.

1D. In case of refraction through a rectangular glass slab the incident and emergent rays are always parallel.

1E. Refractive index decreases with increases of wavelength.

1F. The circle of least confusion is the region where the refracted beam has large diameter.

1G. Coma is an axial aberration.

1H. The term thick lens always refers to a single lens whose thickness is comparable to its focal length.

1I. In an ABCD matrix, element C=0 signifies that the system is telescopic.

1J. A ray directed along the center of the entrance pupil after refraction passes through the center of the exit pupil is called paraxial ray.

1K. Laser is the result of spontaneous emission of photons by the excited atoms.

1L. Microscope objectives of high numerical aperture yields a better image.

(2×10 = 20 marks)

2. Answer any **EIGHT** of the following.

2A. Explain the terms: i) Image of a point ii) Principle of reversibility iii) Conjugate points.

2B. Explain ray tracing technique for refraction through a prism.

2C. Derive Gauss' formula for thin lenses.

2D. Obtain a translation matrix for a ray moving from one point to other in air.

2E. Write a note on astigmatism.

2F. Explain the formation of entrance and exit pupils of a lens with a back stop.

2G. Explain the terms: i) Depth of focus ii) Depth of field iii) F-stop number.

2H. Give a brief account of various sources of light.

2I. Explain the terms: i) Population inversion ii) Metastable state
iii) Resonant cavity iv) Radiation flux density.

2J. Obtain an expression for the numerical aperture of an optical fiber.

(5×8 = 40 marks)

3. Answer any **FIVE** of the following.

3A. A 45° flint glass prism has a refractive index of 1.671 and it is adjusted for minimum deviation. Find i) the angle of minimum deviation and ii) the angle of incidence

3B. The left end of a long plastic rod of index 1.53 is ground and polished to a convex spherical surface of radius -2.65cm. An object 2.5cm high is located in the air and on the axis 16.0cm from the vertex. Find i) the primary and secondary focal lengths ii) Power of the surface iii) the image distance and iv) the size of the image.

3C. An object 2.5cm high is placed 12cm infront of a thin lens of focal length 3cm. Calculate i) the image distance ii) the magnification and iii) the nature of the image

3D. A positive meniscus lens with an index of refraction 2.4 is immersed in a medium of index 1.9. The lens has an axial thickness of 9.6mm and radii of curvature 50mm and 100mm. Compute the system matrix when light is incident on the convex face and show that its determinant is equal to 1.

3E. If a lens of 50mm diameter and 25.4cm focal length has a longitudinal spherical aberration of 4mm, what is its transverse spherical aberration.

3F. A ruby laser emits light at wavelength 694.4nm. If a laser pulse is emitted for 12ps and the energy release per pulse is 150mJ, i) What is the length of the pulse? ii) How many photons are in each pulse?

3G. Light of wavelength 332nm strikes a potassium surface of work function 2.25ev. What is the maximum velocity of the photoelectrons that come off the surface?

(4×5 = 20 marks)