University of Kerala

U8995

Second Semester FYUGP Degree Examination, April 2025

Discipline Specific Core Course

PHYSICS

UK2DSCPHY102 - Optics and Thermodynamics

Academic Level: 100-199

Time: 1 Hour 30 Minutes(90 Mins.)   **Max. Marks: 42**

Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn No.	Question	CL	CO
1	Define polarization.	RE	1
2	State law of reflection.	RE	1
3	Explain adiabatic process.	UN	2
4	Discuss the effect of entropy in a room when a fan is switched ON.	UN	2
5	Discuss the condition for destructive interference.	UN	1
6	Explain rectilinear propagation of light.	UN	1

Part B.8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Explain heat death of the universe.	UN	2
8	Compare Fresnel and Fraunhofer diffraction.	UN	1
9	Solve the speed of light in glass if the speed of light in a vacuum is $3*10^8$ m/s. (The refractive index of glass is 1.5)	AP	1
10	Demonstrate the change in entropy during a reversible process	AP	2

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) A Carnot engine operates between a hot reservoir at 800 K and a cold reservoir at 400 K. It absorbs 2000 J of heat from the hot reservoir per cycle. (a) Apply above data to identify the efficiency of the Carnot engine.	AP	2, 2

Qn No.	Question	CL	CO
	(b) Interpret the efficiency if the cold reservoir temperature increases to 500 K. Illustrate the significance of this change in practical applications. OR B) a) Illustrate the term entropy b) Apply TS diagram to evaluate the internal work done in a reversible Carnot's cycle. c) Employing the TS diagram, construct the expression for efficiency of Carnot's Engine.		
12	A) Calculate the fringe width in Young's double-slit experiment and its dependence on wavelength and slit separation. OR B) a) Analyse the diffraction pattern through a single slit illuminated by a monochromatic light. b) Also examine the change in diffraction pattern if monochromatic light is replaced by white light.	AN	1, 1
13	A) Two students perform a Newton's ring experiment using different wavelengths of light. Student A uses a wavelength of 589nm while student B uses a wavelength of 405nm. If both students uses the same lens with a radius of curvature of 100cm, evaluate which student will observe larger diameter for the fifth dark ring. Justify your answer with relevant formula. OR B) Justify why thin-film interference is responsible for the rainbow-like appearance of oil slicks on water.	EV	1, 1
14	A) Formulate an expression for refractive index and optical path starting from the laws of geometric optics. OR B) Create a conceptual explanation of Fermat's principle to establish that light travels along a path having minimum optical path length.	CR	1, 1