

DATE: 02/07/2022

All Programs

QP CODE: 95474

Examination: FE Semester II \_FH2022

Course Code: FEC202

Course Name: Engineering Physics-II

Time: 2 hours

Max. Marks: 60

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry 2 marks each.
1.	Which of the following is not a property of emitted light in stimulated emission?
Option A:	Incoherent
Option B:	Unidirectional
Option C:	Monochromatic
Option D:	High Intensity
2.	In semiconductor diode laser, the lasing action takes place when the diode is
Option A:	Unbiased
Option B:	reverse biased
Option C:	forward biased
Option D:	in equilibrium
3.	Nanomaterials are the materials with at least one dimension measuring less than
Option A:	1nm
Option B:	10nm
Option C:	100nm
Option D:	1000nm
4.	Maxwell's equation derived from Faraday's law is
Option A:	$\vec{\nabla} \cdot \vec{H} = J$
Option B:	$\vec{\nabla} \cdot \vec{D} = I$
Option C:	$\vec{\nabla} \times \vec{E} = -dB/dt$
Option D:	$\vec{\nabla} \times \vec{B} = -dH/dt$
5.	An object whose length is 60m moves at a speed of 0.6 c. What is the length of the object according to a stationary observer?
Option A:	48m
Option B:	60m
Option C:	21m
Option D:	40m
6.	Calculate acceptance angle for an optical fibre whose core R.I.is 1.48 & cladding R.I.is 1.39
Option A:	$10^\circ$
Option B:	$40.5^\circ$
Option C:	$30.5^\circ$
Option D:	$20^\circ$

Q.2	Answer any 4 questions out of 6	(4 marks each)
A	Draw and explain energy level diagram for He:Ne laser. What is the role of helium atoms?	
B	State and derive maxwell's equation which describes how the electric field circulates around the time varying magnetic field (Differential form).	
C	Explain the concept of time dilation. A particle moving with a speed of $0.7c$ . Calculate the ratio of the rest mass and mass while in motion.	
D	Draw the schematic diagram of Scanning Electron Microscope and explain its construction and working.	
E	Diffraction grating used at normal incidence gives a line $5400 \text{ \AA}$ in a certain order superimposed on the violet line of $4050 \text{ \AA}$ of the next higher order. If the angle of diffraction is $30^\circ$ , how many lines/cm are there in the grating.	
F	A step index fiber has a core diameter of $29 \times 10^{-6} \text{ m}$ . the refractive indices of core and cladding are 1.52 And 1.5189 respectively. If the light of wavelength $1.3 \text{ \mu m}$ is transmitted through the fiber, Determine normalized frequency of the fiber. Whether fiber supports single mode or multimode.	

Q.3	Answer any 4 questions out of 6	(4 marks each)
A	Explain the construction of hologram.	
B	Find the divergence and curl of a vector $\vec{A} = x^2 y \hat{i} + (x - y) \hat{k}$ .	
C	If the kinetic energy of a body is double its rest mass energy calculate its velocity	
D	Define resolving power of grating. Derive an expression for resolving power of grating.	
E	Describe the physical significance of Divergence and Curl.	
F	Derive the expression of numerical aperture for a step index fiber. A light ray enters an optical fiber from air. The fiber has core refractive index 1.52 and cladding refractive index 1.41. Find the Critical angle and Numerical aperture.	

Q.4	Answer any 4 questions out of 6	(4 marks each)
A	Distinguish between step index and graded index optical fiber.	
B	If $\phi(x,y,z) = 3x^2y - y^3z^2$ , Find $\vec{\nabla}\phi$ at the point $(-1, -2, 1)$ .	
C	Discuss the phenomenon of Fraunhofer's diffraction at a single slit and obtain the condition for the first minimum.	
D	Summarize the postulate of special theory of relativity and write Gallilian transformation equation for velocity, position and acceleration.	
E	A parallel beam of light is incident ( $5896 \text{ \AA}$ ) on a slit of width $0.2 \text{ mm}$ Calculate angular and linear width of central maximum formed on the screen $15 \text{ cm}$ away.	
F	Explain any two methods to synthesize nanomaterials.	