University of Mumbai

Curriculum Scheme: Rev2019

All Programs

Examination: FE Semester II _FH2022

Course Code: FEC202   Course Name: Engineering Physics-II

Time: 2 hours   <mark>Max. Marks: 60</mark>

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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:	$\vec{\nabla} . \vec{H} = J$
Option B:	$\vec{\nabla} . \vec{D} = I$
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:	10^0
Option B:	40.5^0
Option C:	30.5^0
Option D:	20^0

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 A^0 in a certain order superimposed on the violet line of 4050A^0 of the next higher order. If the angle of diffraction is 30^0, how many lines/cm are there in the grating.
F	A step index fiber has a core diameter of 29 x10^{-6} m. the refractive indices of core and cladding are 1.52 And 1.5189 respectively. If the light of wavelength 1.3 μm is transmitted through the fiber, Determine normalized frequency of the fiber. Weather 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 $\phi(x,y,z) = 3x^2 y - y^3 z^2$, 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 Gallialian transformation equation for velocity, position and acceleration.
E	A parallel beam of light is incident (5896 A^0) on a slit of width 0.2mm Calculate angular and linear width of central maximum formed on the screen 15cm away.
F	Explain any two methods to synthesize nanomaterials.