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BSM-181

B. TECH.
Year: II Semester: Even
MINOR TEST (EXAMINATION): 2024-2025
Engineering Physics

Time: 2 Hr. **Max. Marks: 20**

Note: Attempt all questions.

		Marks	CO	BL	PO	PI Code
Q. 1	**Attempt any three parts of the following. Part(a) is compulsory. (Unit-I & Unit-II)**					
a.	Show that the ratio of the maximum intensities in case of Fraunhofer diffraction of a single slit is given by $I_0 : I_1 : I_2 \ldots\ldots\ldots :: 1 : \frac{1}{22} : \frac{1}{61} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	4	1	2	1	
b.	Find the minimum number of lines in a plane diffraction grating required to resolve the sodium doublet (5890Å and 5896Å) in the first and second order.	2	2	3	1	
c.	Describe de-Broglie hypothesis and explain it. If an electron has de Broglie wavelength of 5000 A^0, what will be its kinetic energy? Express in eV units.	2	4	3	2	
d.	Discuss Davisson Germer experiment with the help of neat and clean diagram? Explain, how could they confirm the wave nature of moving electrons?	2	4	3	2	
Q. 2	**Attempt any two parts of the following. Part (a) is compulsory. (Unit-I)**					
a.	What do you mean by polarized light? How does it differ from the unpolarized light? Discuss one method to produce polarized light and explain with the help of neat and clean diagram.	4	3	2	1	
b.	Complete destructive interference pattern is observed from a thin film of oil at 5000 A^0 and 7000 A^0, and for no other wavelengths. Find the thickness of the film if its refractive index is 1.3.	2	2	4	2	
c.	Derive the formula to obtain the refractive index of a medium in Newton's Ring experiment. Also explain the process with a neat and clean ray-diagram.	2	1	4	2	
Q. 3	**Attempt two parts of the following. Part (a) is compulsory. (Unit-II)**					
a.	Derive time independent Schrodinger equation. Explain the physical significance of wave function. Write down momentum and kinetic energy operators.	4	4	2	1	
b.	Explain the term group velocity. State and prove Heisenberg uncertainty principle.	2	4	4	2	
c.	What will be the ratio of the de Broglie wavelengths of an electron and a proton, if both posses 10 KeV energy.	2	4	4	2	

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating)
CO – Course Outcomes PO – Program Outcomes (As per Examination Reform Policy by AICTE Page No. 15)
PI Code – Performance Indicator Code **Note: Only applicable for the student admitted in first year from session 2024-25.**

BSM-181

B. Tech. (3/4/5Credit Subjects)
Year: 2024-25 Semester: Even
Major Examination: 2024-25
ENGINEERING PHYSICS

Time: 3 Hrs. **Max Marks: 50**

Note: Attempt ALL questions. Each question carries equal marks

Q1.		Attempt any Five parts of the following. (Unit I & II)	Marks	CO	BL	PO	PI Code
	a)	A soap film of thickness 50 microns is viewed at angle of 35^0 to the normal, find the wavelength of the light in the visible region, which will be absent in the reflected light. Given that refractive index of the soap is 1.43.	2	1	4	1	
	b)	Define the terms "Optical Pumping", "Population Inversion" and "Stimulated Emission of Radiation". Briefly describe construction and function of He-Ne Laser.	2	2	3	1	
	c)	Write down Heisenberg uncertainty principle. If the uncertainties in position and momentum of a particle are both equal, then what will be the uncertainty in its velocity?	2	4	3	2	
	d)	Derive time dependent Schrodinger equation. Explain the physical significance of wave function giving one appropriate example.	2	4	2	1	
	e)	Describe Davission-Germer experiment with the help of neat and clean diagram. How could it prove the wave nature of kinetic electrons?	2	4	2	2	
	f)	In a region of space, a particle with mass m and with zero energy has a time-independent wave function $\Psi(x) = Axe^{-\frac{x^2}{L^2}}$ Determine the potential energy U(x) of the particle.	2	4	4	2	
	g)	Show that an electron cannot reside inside the nucleus of an atom. Given that size of a nucleus is 10×10^{-15} meters.	2	4	3	1	
Q2.		Attempt any Two parts of the following. (Unit-III)					
	a)	Write down Maxwell's electromagnetic equations in integral and differential forms for free space and explain their physical significance.	5	5	3	1	
	b)	What modifications were proposed by Maxwell in Ampere's law and why? Derive Maxwell's fourth law.	5	5	4	1	
	c)	Show that the electric and magnetic vectors in electromagnetic waves are always perpendicular to the wave	5	5	3	1	

		vector.					
Q3.		**Attempt any Two parts of the following. (Unit-III)**					
	a)	Derive first Maxwell equation and explain physical significance of terms in it. How could we derive Maxwell's second equation in parallel analogy with the first equation? Highlight the importance of the second equation.	**5**	5	**4**	1	
	b)	A magnetic field changes at the rate of 0.02 T/s. Find out the induced current in circular loop of radius 2.42 cm having resistance of 4.3 mΩ.	**5**	5	**3**	2	
	c)	Show that $\nabla.(\nabla \times E) = 0$: Here E is an electric field.	**5**	5	**3**	2	
Q4.		**Attempt any Two parts of the following. (Unit-IV)**					
	a)	What do you mean by energy bandgap? Classify materials as conductor, semiconductor and insulator on its basis. Highlight the difference between direct and indirect bandgap semiconductors.	**5**	6	**3**	2	
	b)	Define superconductivity and account reasons for its origin? Briefly explain on the basis of BCS theory. Classify superconductors into different types.	**5**	6	**3**	2	
	c)	Derive London second equation for superconductivity and explain how could it explain Meissner effect?	**5**	6	**3**	2	
Q5.		**Attempt any Two parts of the following. (Unit-IV)**					
	a)	What do you mean by nanomaterials? Classify them as 0D, 1D and 2D nanomaterials and give one appropriate example of each. Write down five potential applications of nanomaterials.	**5**	6	**2**	1	
	b)	Write a comment on intrinsic and extrinsic semiconductor. Discuss chemical bonding in them to explain their semiconducting properties with the help of appropriate examples.	**5**	6	**2**	1	
	c)	Calculate the critical current density for a wire of 1.2 mm diameter at T=6.2 K given that T_c for lead is 7.18 K and H_0=6.5 $\times 10^4$ A/m.	**5**	6	**3**	2	

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