

M.B.S College of Engineering and Technology Jammu.
Department of APSH (2025 BATCH)

Subject: Advanced Engineering Physics
Semester: -1st
Max. Marks: -50

Subject Code: - BST-1103
Branch: - CSE / IT
Date:- 06/10/2025

SESSIONAL-1st

Q1. Multiple choice Questions (10x1= 10)		Marks
1. The basic principle behind laser action is: (CO1) a. Spontaneous emission b. Stimulated emission and population inversion c. Thermal excitation d. Photoelectric effect	6. The Einstein relation between spontaneous and stimulated emission coefficients is: (CO1) a. $A_{21} = B_{21}$ b. $A_{21}/B_{21} = (8\pi h\nu^3)/c^3$ c. $A_{21} = (8\pi h\nu^3)/c^3 B_{12}$ d. $A_{12} = A_{21}$	
2. The outermost layer of an optical fiber is called: (CO1) a. Jacket or buffer coating b. Cladding c. Core d. Shield	7. The unit of numerical aperture (NA) is: (CO1) a. m b. rad c. No unit (dimensionless) d. W/m ²	
3. Einstein coefficients represent: (CO1) a. Rates of spontaneous and stimulated transitions b. Absorption and reflection processes c. Refractive index variations d. Energy losses in the system	8. The Poynting vector represents: (CO5) a. Electric field direction b. Magnetic field direction c. Energy flow per unit area per unit time d. Force per unit charge	
4. The relation for critical angle is: (CO1) a. $\sin \theta_c = n_2 / n_1$ b. $\sin \theta_c = n_1 / n_2$ c. $\tan \theta_c = n_1 / n_2$ d. $\cos \theta_c = n_2 / n_1$	9. The Poynting vector (S) is given by: (CO5) a. $S = E \times H$ b. $S = E \cdot H$ c. $S = H / E$ d. $S = B \times E$	
5. The acceptance cone is defined by the: (CO1) a. Refractive index of air b. Acceptance angle c. Core radius d. Length of fiber	10. The Displacement current exists: (CO6) a. Only in conductors b. Only in insulators c. Only in capacitors d. In regions where electric field changes with time	
Q2:- Answer each of the following questions in one word. 1. The process of increasing the number of atoms in the excited state is called_____.		

(CO1)

2. Optical fibres are mainly made of silica _____. **(CO1)**
3. The symbol ∇ (del) represents the _____ operator. **(CO6)**
4. Displacement current was introduced by _____. **(CO6)**
5. The optical fibre consists of _____. **(CO1)**
6. The pumping source in a Ruby laser is a _____ lamp. **(CO1)**
7. The coefficient B_{21} corresponds to _____ emission. **(CO1)**
8. Wavelength of red He-Ne laser _____ nm. **(CO1)**
9. The SI unit of Poynting vector is _____. **(CO5)**
10. The metastable state has a comparatively _____ lifetime. **(CO1)**

Q3: - Discuss the construction and working principle of optical fiber. Define acceptance angle and aperture and derive expression for them. **(CO1-10)**

OR

- (a)** If $\vec{A} = (x^2 y \hat{i}) + (x - y) \hat{k}$, Find $\text{div } \vec{A}$ and $\text{curl } \vec{A}$ at a point (2,3,0). **(CO6 -5, 5)**
- (b)** Find the $\vec{F} = (x^2 \hat{i}) + (x^2 + y^2) \hat{j}$, Find If $\vec{\nabla} \times \vec{F}$.

Q4: -Define displacement current. Derive Maxwell equations in differential form. Also discuss their characteristics. **(CO5-10)**

OR

Derive wave equation satisfied by $\vec{E}$ and $\vec{B}$ in a free space. Show that E.M. waves travel with the velocity of light in vacuum.

Q5 (a) Discuss the construction and working of He-Ne laser. Explain why a four-level laser system is better than a three-level laser system. **(CO1-5, 5)**

- (b)** A glass clad fiber is made with core glass of refractive index 1.5 and the cladding is doped to give a fractional index difference of 0.0005. Find
- 1) cladding index and
 - 2) numerical Aperture.

