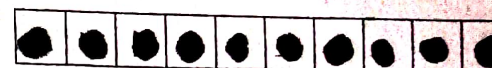# SHAMBHUNATH INSTITUTE OF ENGINEERING AND TECHNOLOGY

Subject Code: BAS 101 **Subject: Engineering Physics**

Course: B. Tech **Semester: I**

Sections: A & B **Branch: ALL**

SECOND SESSIONAL EXAMINATION, ODD SEMESTER, (2024-2025)

Time: 2 hrs. **Maximum Marks – 45**

1. Attempt *any five* questions.

Q N	QUESTION	Marks	CO	BL
a.	Define coherent sources of light.	2	CO3	L1
b.	Why two independent sources not produced interference pattern?	2	CO3	L1
c.	Why Newton's rings are circular and center spot is dark?	2	CO4	L1
d.	State Rayleigh's criterion of resolution.	2	CO4	L1
e.	Draw the energy level diagrams for three and four level lasers.	2	CO5	L2
f.	What do you mean by missing order?	2	CO5	L1

2. Attempt any **ONE** of the following:

Q N	QUESTION	Marks	CO	BL
a.	Show that interference pattern obtained by thin film in reflected light and transmitted light are complimentary to each other	5	CO3	L3
b.	(i) Prove that for reflected light in Newton's rings Experiment, the diameters of dark rings are proportional to square root of natural number. (ii) In N.R experiment, the diameters of 4th and 12th rings are 0.4 cm and 0.7 cm respectively. Find the diameter of 20th ring.	5	CO3	L5 / L1
c.	What do you understand by the phenomenon of Fraunhoffer diffraction? Find out the ratio of intensities of successive secondary maxima compared to the intensity of the principle maximum for the single slit.	5	CO3	L1

3. Attempt *any five* questions.

Q N	QUESTION	Marks	CO	BL
a.	What do you mean by population inversion?	2	CO4	L1
b.	What are the basic components of laser?	2	CO4	L1
c.	What do you mean by acceptance angle and acceptance cone of a fibre?	2	CO4	L1
d.	List a few advantages of optical fibre communication.	2	CO4	L1
e.	Explain the propagation mechanism of optical fiber.	2	CO4	L2
f.	What do you mean by attenuation and dispersion in optical fiber?	2	CO4	L1

4. Attempt any *ONE* of the following:

Q N	QUESTION	Marks	CO	BL
a.	Explain the basic principle of optical fibre. Discuss fibre classification on the basis of refractive index profile.	5	CO4	L2
b.	What are the important features of Stimulated emission? Obtain a relation between transition probabilities of spontaneous and stimulated emissions i.e. Relation between Einstein's coefficients.	5	CO4	L1
c.	(i) The optical power, after propagating through a fibre that is 500 m long is reduced to 25% of its original value. Calculate the fibre loss in dB/km. (ii) Calculate the numerical Aperture, Acceptance angle, critical Angle, V number (cutoff parameter) and number of mode from the following data: refractive index of core = 1.50 , refractive index of cladding = 1.45 , Diameter of core = 50 μm, operating wavelength = 1300 nm.	5	CO4	L1

5. Attempt *any five* questions.

Q N	QUESTION	Marks	CO	BL
a.	What is superconductivity?	2	CO5	L1
b.	What is transition temperature?	2	CO5	L1
c.	What are high TC superconductors? Give an example.	2	CO5	L1
d.	Explain the concept of quantum confinement.	2	CO5	L2
e.	What is the significance of the surface area to volume ratio in Nanomaterials?	2	CO5	L1
f.	What are the potential applications of Nanomaterials in medicine?	2	CO5	L1

6. Attempt any *ONE* of the following:

Q N	QUESTION	Marks	CO	BL
a.	Describe top down (CVD) and bottom up (Sol-Gel) approach for the preparation of Quantum Nanostructure.	5	CO5	L2
b.	What is Meissner's Effect? Show that magnetic susceptibility of Superconductor is negative. Distinguish between Type I (soft) and Type II (hard) superconductor	5	CO5	L1 L2
c.	For a specimen of superconductor, the critical fields are 1.4×10^5 and 4.2×10^5 A/m respectively for temperature 14 K and 13 K respectively. Calculate the transition temperature and critical field at 0 K and 4.2 K.	5	CO5	L1

Bloom's Taxonomy Level (BL):-

Remember (L1), Understanding (L2), Apply (L3), Analyze (L4), Evaluating (L5), Creating (L6)