Srishti

SEMESTER EXAMINATION, DECEMBER - 2024

Course Name: - B.Tech. **Semester:- Ist**

Paper Name: - Engineering Physics **Paper Code:- NBS 101**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark**. **All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.

Section – A
Objective Questions

1. Answer all the following questions. 5x3 =15

i) According to wave-particle duality, what is the relationship between the wavelength and energy of a particle?
   a) Directly proportional
   b) Inversely proportional
   c) No relationship
   d) Quadratically proportional

ii) The Poynting vector represents:
   a) Electric field strength
   b) Magnetic field strength
   c) Rate of energy transfer per unit area
   d) Impedance of the medium

iii) In Young's double slit experiment, the separation between the slits is halved and the distance between the slits and the screen in doubled. The Fringe width is:
   a) Unchanged
   b) Halved
   c) Doubled
   d) Quadrupled

iv) The He-Ne laser consist of a mixture of the He-Ne in a ratio of about:
   a) 2:1
   b) 1:10
   c) 10:1
   d) 1:2

v) A temperature at which the normal material turns into a superconductor is called:
   a) Debye Temperature
   b) Neel Temperature
   c) Curie Temperature
   d) Critical Temperature

Section – B
Short Answer Questions

2. Answer any five of the following questions. 5x7=35

i. If earth receives 2 cal min^{-1} cm^{-2}, what are the amplitudes of electric and magnetic field of radiation?

ii. What is Meissner effect and show that superconductor behaves like perfect diamagnet below critical temperature.

iii. Show that the Compton shift is independent of the wavelength of the incident radiation and depends only on the scattering angle.

iv. What is the resolving power of the instrument? Explain Rayleigh's criterion of resolution. Find the resolving power of grating.

v. Discuss the formation of interference fringes due to a wedge-shaped thin film seen by normally reflected sodium light and obtain an expression for the fringe width

vi. What do you understand by nanomaterials? Discuss Sol-Gel method for synthesis of nano materials.

vii. Give construction and working of Ruby Laser with neat energy Level Diagram.

Section – C
Descriptive Questions

3. Answer any two of the following questions. **2x10=20**

i) What do you understand by acceptance angle, acceptance cone, numerical aperture, relative refractive index, V-number and attenuation loss of an optical fibre cable? Estimate a relation for the acceptance angle and Numerical angle in terms of relative refractive index. Discuss the classification of Optical fibre cable.

ii) Write the Maxwell's equation of EM waves in conductive media and find the expression for Skin depth.

iii) What do you understand by Black body? Discuss Wein's Law and Stefan's Law for black body radiation. How Planks Law for thermal radiation explains the energy density distribution curve for black body radiation?

Section – D
Objective Questions

Semester: I
Subject Name: Engineering Physics **Subject Code: NBS 101**
Duration: 30 Minutes **Max. Marks: 20**

1. Answer all the following questions **10×2 = 20**

(i) An electron and proton have the same de-Broglie wavelength. Then the kinetic energy of the electron is

a. Zero
b. Infinity
c. Equal to the kinetic energy of the proton
d. Greater than the kinetic energy of the proton

(ii) The Eigen value of wave function of a particle inside a rigid box of length L is

a. L/2
b. 2/L
c. $\sqrt{L/2}$
d. $\sqrt{2/L}$

(iii) Maxwell's equation derived from Faraday's law is

a. $\nabla . D = \rho$
b. $\nabla \times E = -\frac{\partial B}{\partial T}$
c. $\nabla . B = 0$
d. $\nabla \times B = \mu J$

(iv) In Newton's ring arrangement the diameter of 10^{th} dark ring changes from 1.5 m to 1.27 cm when a liquid is introduced between the lens and the glass plate. The refractive index of the liquid is:

a. 0.847
b. 0.717
c. 1.8
d. 1.39

(v) What will be the angular separation of the first order fringe from the central maximum, when a light of wavelength 500 nm is diffracted at a slit of width 0.5 mm?

a. 2.1′
b. 3.4′
c. 4.8′
d. 5.6′

(vi) The critical field for niobium is $1X10^5$ A/m at 8K and $2X10^5$ A/m at 0K. The transition temperature of niobium will be

a. 3 K
b. 3.86 K
c. 5,65K
d. 8.32K

(vii) The cooper pair is a system of two electron bound by exchange of:

a. Photon between them
b. proton between them
c. neutron between them
d. phonon between them

(viii) The rate of stimulated emission depends on:

a. Intensity of external field
b. number of atoms in the upper state
c. Number of atoms in the lower state
d. Both a. and b.

(ix) Which component provides additional strength and prevents the fibre from any damage?

a. Core
b. cladding
c. sheath
d. none of the above

(x) Which of the following is an example of a top-down approach in nanofabrication?

a. Chemical vapor deposition
b. Lithography
c. Molecular self-assembly
d. Sol-gel synthesis

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