S-I-B

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MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

7/12/22

Sessional Examination – I : Odd Semester 2022-23

Course/Branch : B Tech - All (OP 4, OP 6, OP 8, OP10) SET B

Subject Name : Engg. Physics **Semester : I**

Subject Code : BAS101 **Max. Marks : 60**

Time : 120 min

CO-1 On completion of this course, the student will be able to explain the distribution of energy in black body radiation and to understand the difference in particle and wave nature with explanation of Compton Effect and Schrodinger wave equation.

CO-2 : On completion of this course, the student will be able to understand the concept of displacement current and consistency of Ampere's law and also the properties of electromagnetic waves in different medium with the use of Maxwell's equations.

Section – A (CO - 1) # Attempt both the questions # 30 Marks

Q.1 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

a) Write the assumptions of Planck's hypothesis.

b) Show that $(x,y,z,t) = (x,y,z,t)\, e^{-iwt}$ is a function of stationary state.

c) Explain physical interpretation of wave function.

d) Discuss the difference between conduction current and displacement current.

e) State Wien's displacement law and Rayleigh-jeans law.

f) Explain the concept of de-Broglie matter waves.

g) Describe the modified and unmodified radiations in Compton scattering.

Q.2 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

a) Show that the phase velocity of de-Broglie wave is greater than the velocity of light.

b) Derive a suitable expression for Compton shift.

c) Explain Schrodinger time independent wave equation.

d) Determine the probability of finding a particle trapped in a box of length L in the region from 0.45L to 0.55L for the ground state.

e) Describe the experiment of Davisson and Germer to demonstrate the wave character of electrons.

Section – B (CO - 2) # Attempt both the questions # 30 Marks

Q.3 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

a) Write down Gauss divergence theorem.

b) Discuss Poynting vector with its dimension and unit.

c) Define depth of penetration.

d) Explain the physical significance of Maxwell's equation.

e) Explain why a magnetic monopole does not exist?

f) Discuss the reason why Maxwell proposed that Ampere law require modification?

g) Describe Maxwell's equations in conductingmedium.

Q.4 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

a) State and deduce Poynting theorem for the flow of energy in an electromagnetic field.

b) Show that electric and magnetic vectors are normal to the direction of propagation of electromagnetic wave.

c) A 100-watt sodium lamp radiating its power. Calculate the electric field and magnetic field strength at a distance of 5m from the lamp.

d) If the earth receives 2 cal /(min-cm square) solar energy, what are the amplitudes of electric and magnetic fields of radiation?

e) Derive equation of continuity from Maxwell's equation.

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NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

Sessional Examination II : Even Semester 2022-23

610 13/6/23

Course/Branch : B Tech - All | **Semester : II**

Subject Name : Engg. Physics | **Max. Marks : 60**

Subject Code : BAS201 | **Time : 120 min**

CO-3 Describe the different phenomena of light and its applications

CO-4 Understand the concepts and applications of fiber optics and LASER

Section – A (CO - 3) # Attempt both the questions # 30 Marks

Q.1 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. **(2 x 6 = 12 Marks)**

a) Difference between single mode and multimode fibre.
b) Explain the principle of an optical fibre.
c) Describe resonator cavity in laser.
d) Write down properties of laser.
e) Compare Ruby laser with He-Ne laser.
f) Differentiate between spontaneous and stimulated emission of radiation.
g) Define Meta stable state and population inversion. (1+1)

Q.2 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. **(3 x 6 = 18 Marks)**

a) Derive expression for acceptance angle and numerical aperture.
b) Discuss classification of optical fibre on the basis of number of mode and refractive index.
c) Calculate the population ratio of two states in He-Ne laser that producers light of wavelength 6000Å at 300 K.
d) A communication system uses a 25 km long fiber having a loss of 2.5 dB/km. The input power is 2500 μW, Compute the output power.
e) Describe the principle and working of Ruby laser system.

Section – B (CO - 4) # Attempt both the questions # 30 Marks

Q.3 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. **(2 x 6 = 12 Marks)**

a) Write the main condition for sustained interference.
b) Explain the necessity of extended sources.
c) Why the centre of Newton's ring is dark in reflected system?
d) Discuss the phenomena of interference of light.
e) Differentiate between thin and wedge shape film.
f) Write down about coherent sources.
g) Two independent sources cannot produce interference. Why?

Q.4 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. **(3 x 6 = 18 Marks)**

a) Calculate the thickness of soap bubble thin film that will result in constructive interference in reflected light. The film is illuminated with light of wavelength 5000Å and refractive index of film is 1.45.
b) Discuss the phenomenon of interference in thin film due to reflected light.
c) What are Newton's rings? Show that diameter for bright rings are proportional to square root of odd natural number and for dark ring, diameters are proportional to square root of natural number.
d) In Newton's ring experiment the diameter of 4^{th} and 12^{th} dark ring are 0.4 cm and 0.7 cm respectively. Deduce the diameter of 20^{th} dark ring.
e) Light of wavelength 6000 Å falls normally on a thin wedge shaped film of refractive index 1.4 forming the fringes that are 2 mm apart. Find the angle of wedge.

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NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

Sessional Examination II : Odd Semester 2022-23 **SET B**

17/1/23

380

Course/Branch : B Tech - All (OP 4, OP 6, OP 8, OP10, OP 12, OP 13, OP 14) **Semester: I**

Subject Name : Engg. Physics **Max. Marks : 60**

Subject Code : BAS101 **Time : 120 min**

CO-4 : To know the functioning of optical fiber and its properties and applications. To understand the concept, properties and applications of Laser.

CO-5 : To know the properties and applications of superconducting materials and nano materials.

Section – A (CO - 4) # Attempt both the questions # 30 Marks

Q.1 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. **(2 x 6 = 12 Marks)**

a) With the help of well diagram, name the components of an optical fibre.
b) Explain the principle of an optical fibre.
c) Why model dispersion is negligible in single mode fibre?
d) Discuss the Difference between single mode and multimode fibre.
e) Compare Ruby laser with He-Ne laser.
f) Differentiate between spontaneous and stimulated emission of radiation. Which one is required for laser action?
g) Define metastable state.

Q.2 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. **(3 x 6 = 18 Marks)**

a) Describe acceptance angle and numerical aperture? Derive expression for Acceptance angle.
b) Establish a relation between Einstein's coefficients.
c) Describe the principle and working of Ruby laser system.
d) A communication system uses a 25 km long fiber having a loss of 2.5dB/km. The input power is 2500μW, Compute the output power.
e) In a Ruby Laser, total number of Cr^{+3} ions is 2.8×10^{19}. If the laser emits radiation of wavelength 6000 Å, then calculate the energy of the laser pulse.

Section – B (CO - 5) # Attempt both the questions # 30 Marks

Q.3 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. **(2 x 6 = 12 Marks)**

a) Define Critical temperature.
b) Write few applications of superconductors.
c) Explain the phenomenon of superconductivity.
d) Differentiate between nanoscience and nanotechnology.
e) Explain the dimension of quantum wire and quantum dot.
f) Describe some properties of matter at bulk and nano scale.
g) What do you mean by quantum confinement?

Q.4 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. **(3 x 6 = 18 Marks)**

a) Distinguish between type I and type II superconductors.
b) Describe Meissner's effect? How it shows that superconductors are perfectly diamagnetic materials.
c) Explain CVD and Sol gel method for synthesis of nano particles.
d) Discuss applications of nanotechnology in various fields.
e) Write short notes on high temperature superconductors.

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NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

Pre University Test (PUT) : Even Semester 2022-23

5/7/23

Course/Branch : B Tech - All (EP1 to EP141) **Semester** : II

Subject Name : Engg. Physics **Max. Marks** : 100

Subject Code : BAS-201 **Time** : 180 min

610

CO-1 *: Understand the concepts of quantum mechanics*

CO-2 *: Derive the expression for EM-wave using Maxwell's equations*

CO-3 *: Describe the different phenomena of light and its applications*

CO-4 *: Understand the concepts and applications of fiber optics and LASER*

CO-5 *: Understand the properties and applications of superconducting materials and nano materials*

Section – A # 20 Marks (Short Answer Type Questions)

Attempt ALL the questions. Each Question is of 2 marks **(10 x 2 = 20 marks)**

Q. No.		COx	Question Description # Attempt ALL the questions. Each Question is of 2 marks
1	A	CO1	Discuss the physical interpretation of wave function.
	B	CO1	Why matter waves are associated with a particle generated when only it is in motion?
	C	CO2	Show that magnetic monopoles do not exist.
	D	CO2	Discuss depth of penetration in conducting medium.
	E	CO3	Write the main condition for sustained interference.
	F	CO3	State Rayleigh criterion of resolution.
	G	CO4	Differentiate between spontaneous and stimulated emission of radiation. Which one is required for laser action?
	H	CO4	Explain the principle of operation of an optical fibre.
	I	CO5	Define persistent current and critical temperature.
	J	CO5	Write down the size of nano particle with properties.

Section – B # 30 Marks (Long / Medium Answer Type Questions)

Attempt ALL the questions. Each Question is of 6 marks **(6 x 5 = 30 marks)**

Q.2 (CO-1) : Find the two lowest permissible energy states for an electron which is confined in one dimensional infinite potential box of width 3.5×10^{-9} m

$E = \frac{n^2 h^2}{8 m a^2}$

9.1×10^{-31}

OR

Find de Broglie wavelength of alpha particle accelerated through 200 volt.

Q.3 (CO-2) : The Earth receives 2 cal/(cm^2- min) energy from Sun. What will be the peak values of electric and magnetic field?

OR

What do you mean by Poynting vector? Write its dimension and unit also. Also calculate the magnitude of Poynting vector at the surface of the Sun. Given that power radiated by Sun is 5.4×10^{28} W and its radius is 7×10^{8} m.

Q.4 (CO-3) : A diffraction grating used at normal incidence gives a yellow line (λ = 6000Å) in a certain spectral order superimposed on a blue line (λ = 4800Å) of next higher order. If the angle of diffraction is $\sin^{-1}(3/4)$, calculate the grating element.

OR

Light of wavelength 6000 Å falls normally on a thin wedge shaped film of refractive index 1.4 forming the fringes that are 2 mm apart. Find the angle of wedge

Q.5 (CO-4) : A communication system uses a 20 km long fiber having a loss of 2.2dB/km. The input power is 2700μW, Compute the output power.

OR

Calculate the population ratio of two states in He-Ne laser that producers light of wavelength 6200 Å at 300K

Q.6 (CO-5) : For a specimen of superconductor, the critical fields are 1.2×10^5 and 3.6×10^5 A/m respectively for temperature 14K and 13K. Calculate the transition temperature and critical field at 0 K and 4.2 K.

OR

Write a short note on Bottom -Up approach of Nanomaterials synthesis. Also explain Sol Gel method in detail

Section – C # 50 Marks (Long Answer Type Questions)

Attempt ALL the questions. Each Question is of 10 marks.

Q.7 (CO-1) : **Attempt any ONE question. Each question is of 10 marks.** **(10 x 1 = 10 marks)**

a. Describe the experiment of Davisson and Germer to demonstrate the wave character of electrons.

b. Explain the reason why Compton Effect is not observed in visible spectrum. Derive a suitable expression for time dependent Schrodinger wave equation. **(2+8 marks)**

Q.8 (CO-2) : **Attempt any ONE question. Each question is of 10 marks.** **(10 x 1 = 10 marks)**

a. Derive the equation for the propagation of plane electromagnetic wave in free space. Show that the velocity of plane electromagnetic wave in free space is given by $c = 1/\sqrt{\sqrt{\mu_0 \epsilon_0}}$ and also show that electric and magnetic vectors are normal to the direction of propagation of electromagnetic wave. **(2+4+4 marks)**

b. State and deduce Poynting theorem for the flow of energy in an electromagnetic field and write Maxwell's equations in integral form. **(2+6+2 marks)**

Q.9 (CO-3) : Attempt **any ONE question. Each question is of 10 marks.** **(10 x 1 = 10 marks)**

a. Discuss the phenomena of Fraunhofer's diffraction at a slit and show that relative intensities of the successive maximas are nearly

$$1 : (4/9\pi^2) : (4/25\pi^2) : \ldots\ldots$$

b. Explain the formation of Newton's rings. Show that diameter for bright rings are proportional to square root of odd natural number and for dark ring, diameters are proportional to square root of natural number. **(2+8 marks)**

Q.10 (CO-4) : **Attempt any TWO question. Each question is of 5 marks.** **(5 x 2 = 10 marks)**

a. Explain different types of optical fibre based on materials, modes and refractive index..

b. Describe the principle and working of Ruby laser system. Compare it with He-Ne laser.

c. Derive the expression of acceptance angle and numerical aperture in optical fibre.

Q.11 (CO-5) : **Attempt any TWO question. Each question is of 5 marks.** **(5 x 2 = 10 marks)**

a. Write a short note on Top-down approach of Nanomaterials synthesis. Also explain chemical vapour deposition method (CVD).

b. Discuss Meissner effect. Show that the perfect diamagnetism and zero resistivity are two independent and essential properties of the superconductor

c. Differentiate between type I and type II superconductors. Discuss high temperature superconductors also.