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QUESTION BANK (DESCRIPTIVE)

Subject with Code: PHYSICS (18HS0850) **Course & Branch**: I B.Tech –ME.
Year & Sem: I-B.Tech& I-Sem **Regulation:** R18

UNIT –I -(ELECTROMAGNETISM AND MAGNETIC PROPERTIES OF MATERIALS)

Short Answer (2 mark) Questions

1 What is displacement current and write its expression? (2M)
2 State Faradays First Law of electromagnetic induction? (2M)
3 Define electric flux? (2M)
4 Define magnetic susceptibility? (2M)
5 What is the relation between B,H and M? (2M)

Essay Answer (10 mark) Questions

1 a)State and explain coulomb's inverse square law in electricity? (6M)
b) Two electrons are a meter apart. What is the force between them? What direction is it in? (4M)
2 a) Derive and explain gauss's law in electrostatics. Write any two applications? (6M)
b) If a point charge q is placed at the center of a cube what is the flux linked with the cube and with the each face of the cube? (4M)
3 a)State and explain Ampere's law in magneto statics? (6M)
b) Write brief note onLenz's law inmagneto statics? (4M)
4 a)State and explain Biot- Savart law?? (4M)
b) Explain the Faraday's laws of electromagnetic induction? (6M)
5 a) Write Maxwell's equation in Integral form, and give its physical interpretation (5M)
b) What is meant by displacement current? (5M)
6 a)State and write Maxwell's equation in differential form? (5M)
b) Derive the continuity equation and write its significance? (5M)
7 a) Define i) magnetic moment ii) magnetic permeability (4M)
b) Explain the origin of magnetic moment in an atom? (6M)
8 a) Define i) magnetization ii) magnetic flux density and iii) relative permeability. (3M)
b) Derive relation between μ_r and χ? (5M)
c) A magnetic material has a magnetization of 3300 A/m and flux density of 0.0044 Wb/m^2. Calculate the magnetizing force and relative permeability of the material? (2M)
9 a) Describe the classification of magnetic materials based on spin magnetic moments? (7M)
b) Discuss the applications of soft magnetic materials? (3M)
10 a) Explain hysteresis curve of ferromagnetic material? (6M)
b) What are soft and hard magnetic materials? (4M)

UNIT –II– (ELECTROMAGNETIC WAVES)

Short Answer (2 mark) Questions

1 What are the radiations in electromagnetic spectrum? (2M)
2 Write any four properties of electromagnetic wave? (2M)
3 Write any two uses of electromagnetic wave (spectrum)? (2M)
4 Write electromagnetic wave equations for both E and B? (2M)
5 Define pointing vector? (2M)

Essay Answer (10 mark) Questions

1 a) Show that the electromagnetic waves are in transverse nature? (7M)
b) Define electromagnetic spectrum? (3M)
2 (a) Derive the electromagneticwave equation using Maxwell's equations? (6M)
(b)Showthat the velocity of the EM wave is $\frac{1}{\sqrt{(\mu_0 \varepsilon_0)}}$? (4M)
3 a) Deduce the relation between the Electric (E) and Magnetic (B) fields of electromagnetic Waves? (8M)
b) Define electromagnetic waves? (2M)
4 a) Derive the Maxwell's equations in vacuum? (4M)
b)Compare the electromagnetic wave and sound waves? (6M)
5 Define the equation of electromagnetic wave and hence evaluate the velocity of light in free space? (10M)
6 b) Explain momentum carried by an electromagnetic wave? (5M)
b) Explain radiation pressure of electromagnetic waves with example? (5M)
7 Derive an expression for energy carried by electromagnetic waves? (10M)
8 a)Write the properties of electromagnetic waves? (6M)
b) Explain the electromagnetic spectrum? (4M)
9 a)Write brief note on harmful effects of electromagnetic radiation (7M)
b) How we protect our self from harmful effects of electromagnetic radiation (3M)
10 a) State and write the expressions for Pointing vector, energy and momentum of electromagnetic waves? (6M)
b) What are the uses of various radiation of electromagnetic spectrum? (4M)

UNIT-III-(WAVES, OPTICS & ACOUSTICS)

Short Answer (2 mark) Questions

1 What are the characteristics of simple harmonic oscillation? (2M)
2 Define Damped harmonic vibrations? (2M)
3 Write necessary conditions for good interference? (2M)
4 A class room of volume 200 m^3 has a reverberation time 1.6 seconds. Calculate the total sound absorption coefficient of the class room? (2M)
5 Write the units for intensity of sound and pitch of sound? (2M)

Essay Answer (10 mark) Questions

1 a) Derive general differential equation of motion for a simple harmonic oscillator and obtain its solution? (7M)
b) Name the periodic motion which is not oscillatory? (3M)
2 a) Define damped harmonic oscillations. Write the differential equation for damped harmonic oscillator. And give its solution? (6M)
b) Discuss the special cases of oscillatory motion? (4M)
3 a) Discuss the theory of forced harmonic oscillations? (5M)
b) Define damped vibrations and forced vibrations? Giving one example of each? (5M)
4 a) Describe the formation of Newton's ring with necessary theory. (7M)
b) Explain how the wavelength of light sources is determined by forming Newton's ring?(3M)
5 a) Derive the conditions for bright and dark colors? Through the interference in thin films by reflection? (7M)
b) Calculate the thickness of soap film (μ=1.463) that will result in constructive interference in the reflected light, if the film is illuminated normally with light whose wavelength in free space is 6000 $\overset{0}{A}$. (3M)
6 a) Distinguish between interference and diffraction? (5M)
b) How we get different colors on thin films? (5M)
7 a) Discuss Fraunhofer single slit diffraction. (7M)
b) Draw intensity distribution curves and give condition for bright and dark fringes in single slit diffraction pattern. (3M)
8 a) Define Reverberation and Reverberation time? (4M)
b) What is the basic requirement of acoustically good hall? (6M)
9 a) Write Sabine's formula for reverberation time? Mention factors controlling the reverberation time? (6M)
b) A hall of volume 1000 m^3 is found to have a reverberation time of 2 seconds. If the area of the sound absorbing surface is 350 m^2, calculate average absorption coefficient? (4M)
10 a) Define and derive the absorption coefficient? (6M)
b) A class room of volume 360 m^3 has a reverberation time 1.6 seconds. Calculate the total sound absorption coefficient of the class room? (4M)

UNIT-IV-(LASERS)

Short Answer (2 mark) Questions

1 What are the characteristics of laser? (2M)
2 Define Meta stable state? (2M)
3 What is life time of an atom?Give the life time of Hydrogen atom in excited state? (2M)
4 How laser radiation is utilized in medical field? (2M)
5 What are the various techniques of pumping? (2M)

Essay Answer (10 mark) Questions

1 a) Describe the important characteristic of laser beam? (6M)
b) Explain the difference between spontaneous and stimulated emission of radiation? (4M)
2 a) Derive the relation between the various Einstein's coefficients of absorption and emission of radiation. (6M)
b)the wavelength of emission is $6000\ \overset{0}{A}$ and the coefficient of spontaneous emission is 10^6/s. Determine the coefficient for stimulated emission? (4M)
3 a) Differentiate between Laser beam and ordinary light beam (5M)
b) Explain the various pumping mechanisms? (5M)
4 a) Write brief note on basic components of laser with the help of neat diagram? (6M)
b) Define Meta stable state and write its significance? (4M)
5 a) Explain the construction and working principle of He-Ne laser with suitable energy level diagram. (8M)
b) Write few advantages of He-Ne laser. (2M)
6 a) State population inversion and give its importance in the production of laser? (6M)
b) Calculate the population of the two states in He:Ne laser that produces light of wavelength $6328\ \overset{0}{A}$ at $27^0 C$? (4M)
7 a) Explain the construction and working of Nd:YAGlaser with suitable energy level diagram? (8M)
b) What are the advantages of Nd:YAG laser? (2M)
8 a) Distinguish between He:Ne laser and Nd:YAG laser? (6M)
b) Explain the mono chromaticity and coherence of characteristics of laser? (4M)
9 a) Write short note on applications of lasers in scientific field? (5M)
b) What is lasing action? (5M)
10 a) State and explain the absorption process? (5M)
b) Write short note on applications of lasers in medical field? (5M)

UNIT-V–(PHYSICS OF NANOMATERIALS)

Short Answer (2 mark) Questions

1 Define top down and bottom up process? (2M)
2 What is the principle in the Ball milling synthesis process of nanomaterial? (2M)
3 Write allotropes of Carbon? (2M)
4 What are the various structures of carbon nanotubes? (2M)
5 What are the sizes of water molecule and human hair? (2M)

Essay Answer (10 mark) Questions

1. a) What is nanomaterial? Write the classification of nanomaterials (4M)
   b) Explain the basic principle of nanomaterials. (6M)
2. a) What is Quantum Confinement? (4M)
   b) Write the applications of nanomaterial? (6M)
3. a) Explain why surface to volume ratio very large forNano materials? (6M)
   b) Find the surface area to volume ratio of Sphere using surface area and volume calculation for the given radius is 5 meter? (4M)
4. a) What are the techniques available for synthesizing nanomaterials? (3M)
   b) Explain ball milling technique for synthesis of nanomaterial? (7M)
5. a) Explain Sol-Gel technique for synthesis of nanomaterial? (7M)
   b) Write advantages of sol-gel process? (3M)
6. a) What are the differences between nanotechnology and NanoScience? (5M)
   b) Write short note on physical properties of carbon nanotubes? (5M)
7. a) What are carbon nanotubes? Mention its structures? (5M)
   b) Write brief note on applications of Carbon nanotubes? (5M)
8. a) What is nanotechnology? And give applications of carbon nanotubes (CNT'S) in biomedical field? (6M)
   b) What are allotropes? Write allotropes of Carbon? (4M)
9. a) Define Condensation, Crystal growth and Nucleation? (6M)
   b) Write brief note on working and characteristics of carbon nanotubes basedfield effect transistor (FET)? (4M)
10. a) Mention the important applications of carbon nanotubes in information technology? (5M)
    b) Explain the sensor and catalyst applications of carbon nanotubes? (5M)