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QUESTION BANK (DESCRIPTIVE)

Subject with Code: ENGINEERING PHYSICS (19HS0848) **Year & Sem:** I-B.Tech & I-Sem
Course & Branch: I B.Tech – Civil Engineering. **Regulation:** R19

UNIT – I

MOTION OF PARTICLES

1. a) Define vector and scalar quantities and give two examples. (4M)
   b) Define gradient of a scalar field and give its physical significance with examples. (8M)
2. a) Define gradient of a scalar field. (4M)
   b) Show that F = -grad V. (8M)
3. a) Explain the divergence of a vector field and give its physical significance. (8M)
   b) If *r* is the position vector of a point, then show that a) div *r* = 3 and b) div (*r*.A) = A. (4M)
4. a) Define dot product of two vectors and write their properties. (8M)
   b) Two vectors are given by A=4ĵ-7k̆ and B=5î+3ĵ find their dot product. (4M)
5. a) Define curl of a vector and write its physical significance. (4M)
   b) If A = 2xi+2yj+3zk, find curl A. (4M)
   c) If r is the position vector of point, prove that curl r = 0 (4M).
6. a) State and explain Newton's laws of motion. (6M)
   b) Derive Newton's first law and third law from second law of motion. (6M)
7. a) Define inertial and non-inertial frame of reference. (4M)
   b) Obtain an expression for velocity of a body moving in a rotating frame of reference with constant angular velocity. (8M)
8. a) Define torque and show that torque is the rate of change of angular momentum. (6M)
   b) Define angular momentum. Write the importance of angular momentum in rotatory motion. (6M)
9. a) State and explain the Kepler's laws of planetary motion (6M)
   b) If the Earth be one half of its present distance from the sun, what will be the number of days in a year? (4M)
10. a) State and explain Kepler's laws of planetary motion. (8M)
    b) The semi major axes of the orbits of Mercury and Mars are respectively 0.387 and 1.524 in a.u. If the period of Mercury is 0.241 year, what is the period of Mars? (4M)

UNIT-II

Physics of Solids

1. a) Define the following

   i) elasticity ii) isotropic materials iii) rigid body iv) Plasticity (6M)

   b) What is stress and explain the different types of stresses. (6M)

2. a) What is Hook's law? Explain. (6M)

   b) Describe the behavior of a wire under an increasing load. (6M)

3. a) Define the three elastic moduli. (6M)

   b) Derive the relation between them. (6M)

4. a) Mention the different types of supports. (8M)

   b) Calculate Poisson's ratio for silver. Given it's Young's modulus $=7.25 \times 10^{10}$ N/m^2 and bulk modulus $= 11 \times 10^{10}$ N/m^2. (4M)

5. a) Classify different types of beams. (8M)

   b) Obtain an expression for the internal energy due to strain. (4M)

6. a) Define strain. Explain the types of strains. (8M)

   b) A wire of 3.0 cm long and 0.625 sq,cm in cross section is found to stretch by 0.3 cm under a tension of 1200 kg. What is Young's modulus of the material of the wire. (4M)

7. a) Define Young's modulus and bulk modulus. (4M)

   b) Obtain the relation between the Young's modulus and bulk modulus. (8M)

8. a) Define Young's modulus and rigidity modulus. (4M)

   b) Obtain the relation between rigidity modulus and Young's modulus. (8M)

9. a) Define shear strain. Explain how shear strain is related to modulus of rigidity. (8M)

   b) The Young's modulus for steel is $Y=2 \times 10^{11}$N/m^2 and its rigidity modulus $\eta=8 \times 10^{10}$N/m^2. Find the Poisson's ratio and its bulk modulus. (4M)

10. a) Obtain an expression for energy stored per unit volume in stretched wire. (8M)

    b) Find the work done in stretching a wire of cross section 1.25 mm^2 and length 1.9 m through 0.14 mm. The Young's modulus of wire is 45 GN/m^2. (4M)

UNIT-III

Acoustics of Buildings and Ultrasonics

1. a) Define reverberation and reverberation time. (6M)

   b) Explain the factors affecting the reverberation time. (6M)

2. a) Explain reverberation. (5M)

   b) Derive Sabine's formula for reverberation time. (7M)

3. a) Define: a) absorption coefficient b) Open window unit c) Sabine. (5M)
   b) Explain the determination of absorption coefficient of a sample using Sabine's formula. (7M)
4. a) Explain reverberation and reverberation time. (6M)
   b) A hall of volume 2 m^3 with an absorption coefficient of 4 open window units. Calculate its reverberation time. (6M)
5. a) Describe the factors affecting the acoustics of buildings. (6M)
   b) Outline the remedies that must be followed for an acoustically good hall. (6M)
6. a) What are ultrasonics? Mention their wavelength. (6M)
   b) Outline the properties of ultrasonic waves. (6M)
7. a) Describe the piezoelectric effect. (5M)
   b) Explain the production of ultrasonics by piezoelectric method. (7M)
8. a) Describe the production of ultrasonics by piezoelectric method. (7M)
   b) Calculate the capacitance to produce ultrasonic waves of 10^6 Hz with an inductance of 1 henry. (5M)
9. a) Give any four of methods for the detection of ultrasonics. (4M)
   b) Write the applications of ultrasonics. (8M)
10. a) Explain the properties of ultrasonics. (8M)
    b) A piezo electric crystal has a thickness 0,002 m. If the velocity of sound wave in crystal is 5750 m/s, calculate the fundamental frequency of crystal. (4M)

UNIT –IV

Harmonic Oscillators

1. a) Define simple harmonic motion. Give three examples. (4M)
   b) Derive the equation of motion of simple harmonic oscillator and find its solution. (8M)
2. a) What is a simple harmonic oscillator? Derive the equation of motion of simple harmonic oscillator. (8M)
   b) A particle executes SHM with a period of 0.002 sec and amplitude of 10 cm. Find its acceleration when it is 4 cm away from its mean position and also obtain its maximum velocity. (4M)
3. a) Define simple harmonic motion and simple harmonic oscillator. Give exampls. (6M)
   b) A particle executing S.H.M is represented by $x=10\sin(4\pi t+\pi/3)$ m. Find the

frequency and the displacement after a time of 1 second. (6M)

4. a) Define damped harmonic motion. Give two examples. (5M)

   b) Derive and solve differential equation of damped harmonic oscillator. (7M)

5. a) Distinguish between damped and forced oscillations. (4M)

   b) Solve the differential equation of damped harmonic oscillator. (8M)

6. a) Define quality factor of an oscillator. Write its significance. (6M)

   b) The amplitude of a second pendulum falls to half of its initial value in 150 seconds. Calculate the Q factor. (6M)

7. a) Explain different types of damped oscillations with suitable examples. (6M)

   b) A point performs damped oscillations according to the law $x=a_o e^{-bt} \sin \omega t$. Find i) the oscillation amplitude and ii) velocity of the point at the moment t=0. (6M)

8. a) What are damped oscillations? Solve the differential equation of a damped harmonic oscillator. (7M)

   b) Discuss the case of under damped motion. (5M)

9. a) What are forced oscillations? Give examples. (6M)

   b) Explain the phenomenon of resonance with suitable examples. (6M)

10. a) Distinguish between damped and forced oscillations with suitable examples. (4M)

    b) Explain the phenomenon of resonance and write the applications of resonance in various fields. (8M)

UNIT-V

(PHYSICS OF NANOMATERIALS)

1. a) Define Nano science and nanotechnology. (4M)

   b) Explain the basic principles of nano materials. (8M)

2. a) Describe the classification of nanomaterials with suitable examples. (6M)

   b) Nanomaterials behave differently in their properties than the bulk materials. Justify. (6M)

3. a) What are nanomaterials? Explain their classification. (6M)

   b) Explain in detail the quantum confinement effect and how it affects the optical properties of nanomaterials. (6M)

4. a) What are nanomaterials? Explain the basic principles of nanomaterials. (6M)

   b) Outline the properties of nanomaterials that are affected due to increased surface area to volume ratio. (6M)

5. a) Explain the synthesis of nanomaterials by ball milling method. (6M)

   b) Discuss in detail the applications of nanomaterials in various fields. (6M)

6. a) Describe the sol-gel method of synthesis of nanomaterials. (6M)

   b) Give any four applications of nanomaterials. (6M)

7. a) Describe any one method of fabrication of nanomaterials. (6M)

   b) Write any four applications of nanomaterials. (6M)

8. a) Discuss the importance of nanomaterials in science and technology. (5M)

   b) Expalin how nanomaterials are used in the field of medicine and sensor technology. (7M)

9. a) Explain the basic principles of nanomaterials. (6M)

   b) Write any five applications of nanomaterials. (6M)

10. a) Explain the basic principles of nanomaterials. (6M)

    b) Explain any one method of fabrication of nanomaterials. (6M)