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QUESTION BANK (DESCRIPTIVE)

Subject with Code : PHYSICS (18HS0848)
Course & Branch: I-B. Tech – CE **Year & Sem:** 2018-2019 I- B. Tech & I-Sem **Reg:** R18

UNIT – I
MOTION OF PARTICLES

Very short answer questions **(2M)**

1 Define vector and scalar and give two examples.
2 Define force what are the basic forces in nature.
3 Define Newton's first law of motion?
4 Define Newton's second law of motion?
5 Define Newton's third law of motion?

Long answer questions

1. a) Define vector and scalar and give two examples. (4M)
   b) Define force, explain about the basic forces in nature with its rage and magnitude. (7M)
2. a) Define scalar product of vectors and give its properties. (7M)
   b) Vectors is given by A=2î+3ĵ-4ǩ, by B=6î-8ĵ-3ǩ find out the angle between them. (3M)
3. (a) Define vector product of vectors and give its properties? (7M)
   (b) Vectors is given by A=4ĵ-7ǩ, by B=5î+3ĵ find out the sine angle between them. (3M)
4. (a) Define Newton's first law of motion and where it is noticed. (3M)
   (b) When a car suddenly stops, the objects in the back seat are thrown forward. Why? (3M)
   (c) A moving ball strikes another of mass 0.2 kg at rest and exerts a force of 100 N for a time of 10 millisecond. Find the speed acquired by the ball at rest. (4M).
5. (a) Define Newton's second law of motion. (3M)
   (b) Derive the relation for masses to its acceleration of bodies by Newton's second law. (7M)
6. (a) Distinguish between scalar and vectors. (6M)
   (b) Derive the equations for Newton's first and third laws form Newton's second law (4M).
7. (a) Define the Newton's third law of motion. (3M)
   (b) How can you say that action and reaction forces are must act on different body than same body? (3M).
   (c) A bullet of mass 0.04 kg moving with a speed of 90 m/s enters a heavy wooden block and is stopped after a distance of 60 cm. what is the average resistive force exerted by the block on the bullet? (4M)
8. (a) Define isolated and variable mass systems? (3M)
   (b) Formulate Newton's second law for a variable mass system (7M).
9. (a) Explain the principle of working of a rocket. (2M)
   (b) Derive an equation for the final velocity of the rocket and its special cases. (8M)
10. (a) Derive the equations for Newton's third law form Newton's second (6M)
    (b) The position vector of a particle of mass m moving under the influence of a force is given by r= A sinωt î+B cosωt ĵ. Find its momentum and force (4M)

UNIT-II
FRAMES OF REFERENCES

Short answer questions **(2M)**

1. What are the inertial and non inertial frames?
2. What are the inertial forces?
3. Define the term centrifugal force?
4. Delineate the term coriolis force?
5. What is hungry operator?

Long answer questions

1. (a) Derive the expression for acceleration of particle in rotating co ordinate system. (7M)
   (b) Develop the concepts of centrifugal force and coriolis force (3M)
2. (a) Obtain the equation for the total force acting on the particle which is moving with a velocity with respect to the rotating frame. (10M)
3. (a) What is rotating frame? (3M)
   (b) Calculate the values of centrifugal and coriolis forces on mass 20 gm placed at a distance of 10 cm from the axis of rotation frame of references if the angular frequency of rotation of the frame is 10 rad/sec. (7M)
4. Explain the effect of coriolis force due to rotation of earth. (10M)
5. (a) Write the differences between centrifugal and centripetal forces. (5M)
   (b) Write the applications of centrifugal and coriolis forces. (7M)
6. (a) Distinguish between inertial and non inertial frames. (5 M)
   (b) Calculate the magnitude and direction of the coriolis force on mass of ice $5x10^8$ kg near the north pole moving west at the rate of 0.02 meter per sec. (Angular velocity of rotation of earth is $0.727x\ 10^{-4}$ rad per sec) (5M)
7. (a) Write the brief note on effect of coriolis force on weather systems. (5M)
   (b) If an object is dropped from height of 200 metres at latitude 45^o, calculate the magnitude of deflection. (5 M)
8. (a) What is coriolis force? Under what conditions it equals to zero and maximum. (5M)
   (b) Calculate the fictitious force and total force acting on freely falling body whose mass is 5 kg with respect to frame moving downward with acceleration of 2 m/sec^2. (5M)
9. (a) Write the properties of inertial forces. (5M)
   (b) A body is dropped from a height of 490 m above the earth. Assuming g is constant, find the deflection of the body from the vertical due to coriolis force when it is reaches to the ground? (where latitude is zero) (5M)
10. (a) Estimate the magnitudes of centrifugal and coriolis forces on mass 400 gm placed at a distance of 25 cm from the axis of rotation frame of references if the angular frequency of rotation of the frame is 30 rad/sec. (5M)
    (b) Give the examples for centrifugal and coriolis forces. (5M)

UNIT-III
HARMONIC OSCILLATIONS

Short answer questions **(2M)**

1. Define the simple harmonic motion.
2. What are the physical characteristics of simple harmonic motion?
3. Define the terms (i) Amplitude, (ii) Frequency
4. What are damped oscillations?
5. What is resonance?

Long answer questions

1. (a) Establish the equation of motion of simple harmonic oscillator. (5M)
   (b) Derive the solution for equation of simple harmonic oscillator. (5M)
2. (a) What is simple harmonic oscillator? (3M)

(b) Obtain the expressions for characteristics of SHM such as velocity, time period and frequency through solution of equation for simple harmonic oscillator. (7M)

3. (a) Define the terms (i) Frequency (ii) Phase (iii) Epoch, of simple harmonic motion. (6M)
(b) A particle performing simple harmonic motion (SHM) has a maximum velocity of 0.4m/s and maximum acceleration of 0.8 m/sec^2. Calculate the amplitude and period of oscillator. (4M)
4. (a) Derive the equation of motion of damped harmonic oscillator. (5M)
(b) Obtain the solution for equation of damped harmonic oscillator. (5M)
5. Solve the differential equation of damped harmonic oscillator and discuss the special cases when it is over damped and under damped. (10 M)
6. (a) Define the terms force constant and dissipation constant? (5M)
(b) A particle executes S.H.M. with a period of 0.002 sec and the amplitude 10 cm. Find its acceleration when it is 4 cm away from its mean position? (5M)
7. (a) What is forced vibration? (3M)
(b) Derive the differential equation of motion of particle under forced vibrations? (7M)
8. (a) State the phenomenon of resonance and its examples. (5M)
(b) A body of mass 3 kg is hanging from a vertical spring. When a mass of 0.5 kg is gently added the spring is further stretched by 5 cm. If the extra mass is removed and the first is set into oscillation, calculate the period of oscillation. (5M)
9. (a) Write the differences between forced vibrations and free vibrations. (5M)
(b) A particle of mass 5 gm executes S.H.M. has amplitudes of 8 cm. If it makes 16 vibrations per sec find the maximum velocity? (5M)
10. (a) Write the examples of resonance in daily life. (5M)
(b) A body of mass 4.9 kg hangs from a spring and oscillates with a period of 0.6 sec. How much will the spring shorten when the body is removed? (5M)

UNIT –IV
MECHANICS OF SOLIDS

Short answer questions **(2M)**

1. Define elasticity and plasticity.
2. Define hooks law.
3. Define stress and strain.
4. Define three elastic constants of isotopic solids.
5. Define Poisson ratio.

Long answer questions

1. a) What is Hook's law? Describe the behavior of wire under an increasing load. (7M)
b) One end of a wire 2 m long and 0.2 cm^2 in cross-section is fixed in a ceiling and a load of 4.8 kg is attached to the free end. Find the extension of the wire Young's modulus of steel=2.0×1011 N/m^2. Take g=10m/s^2. (3M)
2. a) Define three elastic modules and write the equations. (7M)
b) A wire 3 m 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? (3M)
3. a) Explain the classification of beams. (7M)
b) Find the work done in stretching a wire of cross-section 1.25 mm^2 and length 0.14 mm. the Young's modulus of wire is 45 GN/m^2. (3M)
4. a) Derive equation for energy stored per unit volume in stretched wire. (7M)
b) A uniform steel wire of density 7800 kg/m^3 is 2.5 m long and mass 15.6×10^{-3} kg. it extends by 1.25 mm when loaded by 8 kg. Calculate the value of Young's modulus for steel (3M)
5. a) Explain different types of supports. (7M)
b) Compute the weight to be suspended from the end of a steel wire of 2 m in length and 2 mm in diameter to increase the length by 1 mm. (take g= 9.8 m/s^2 and Y=19×10^2 N/m^2). (3M)
6. a) Explain the terms (i) strain (ii) longitudinal strain, (iii) volume strain and (iv) shearing strain (v) stress. (10M)

7. a) Define the bulk modulus (K) and Young's modulus (Y) and explain their significance in elastic materials. (7M)
   b) The Young's modulus for steel is Y= 2×10^{11} N/m^2 and its rigidity modulus $\eta=8\times10^{10}$ N/m^2. Find the Poisson's ratio and its bulk modulus. (3M)
8. a) Explain the terms rigidity modulus (η) and poisson's ratio of elastic materials and write its importance in elastic materials. (7M)
   b) Calculate Poisson's ratio for sliver. Given its Young's modulus=7.25×10^{10} N/m^2 and bulk modulus =11×10^{10} N/m^2. (3M)
9. a) Define the terms (i) elastic limit, (ii) yield strength, (iii) tensile strength (iv) ductility (v) creep (vi) brittleness (vii) breaking stress. (10M)
10. a) Classify the different types of beams and give clear explanation about them? (5M)
    b) Classify the different types of supports and give clear explanation about them? (5M)

UNIT-V
(PHYSICS OF NANOMATERIALS)

Two marks questions **(2M)**

1 What is nanoscience and nanotechnology?
2 What are the advantages of nanotechnology?
3 What are the challenges in nanotechnology??
4 Write allotropes of carbon?
5 What are the applications of nanomaterials in medical field?

II. Essay questions

1. a) What is nanomaterial? Write the classification of nanomaterials. (4M)
   b) Write a note on basic principles of nanomaterials (6M)
2. a) What is quantum confinement? (4M)
   b) Write the applications of nanomaterials? (6M)
3. a) Explain why surface to volume ratio very large for nanomaterials? (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 is the origin of nanotechnology? (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 are nano, nanoscience, nanomaterials and nanotechnology? (6M)
   b) What are allotropes? Write allotropes of carbon? (4M)
9. a) What are the properties of CNTs? (5M)
   b) Write brief note applications of CNTs for energy and in automobiles with examples. (5M)
10. a) What is graphene? (3M)
    b) Write brief note properties and applications of graphene in various fields. (5M)

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